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DETERMINANTS OF ENVIRONMENTAL PERCEPTIONS OF RURAL INHABITANTS IN BUSHBUCKRIDGE, SOUTH AFRICA

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A research report submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Science in Resource Conservation Biology

(Coursework and Research Report)

Johannesburg, February 2016

DECLARATION

I declare that this research report is my own, unaided work except where acknowledged. It is being submitted for the Degree of Master of Science in Resource Conservation Biology to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



_____

(Signature of candidate)

19th day of February, 2016 in Johannesburg

ABSTRACT

Environmental perceptions have been researched in a wide range of communities globally. However, the environmental perceptions of rural people in the developing world, as well as their determinants, remain understudied. Investigating rural inhabitants' environmental perceptions and what shapes them can produce useful information that could be incorporated into decision-making process that help resolve environmental issues. This study aimed to investigate dominant environmental perceptions and their determinants at individual, household and village levels, with a focus on environmental resource use, resource availability, and resource governance and management, among rural inhabitants of Bushbuckridge region in Mpumalanga Province, South Africa. This study used unanalysed pre-existing data for 300 rural households across five villages, collected via a questionnaire in 2006. Of the twelve local resources considered, fuelwood, edible wild herbs, grass and twigs for brooms, reed mats and wooden carvings were the most widely used resources. Building poles, thatch for roofs, and bushmeat were the least widely used resources. On the frequency of use of consumable resources, most households consumed fuelwood every day while edible wild herbs, wild fruits and edible insects were mostly consumed 1-3 times/week. The majority of user households used traditional medicine and bushmeat less than once a month. The majority of respondents perceived local availability of edible wild herbs, traditional medicine, edible insects, and wild fruits to be adequate. By contrast, less than a third of respondents indicated sufficient local supply of building poles, bushmeat and fuelwood. However, it was dominantly perceived that it is not necessary to get harvesting permits for most resources, except in the case of traditional medicines. The chief was repeatedly perceived to be the ultimate authority in issuing harvesting permits and regulating access to natural resources. Individual and household level characteristics, as well as village resided in, were found to shape a range of individuals' environmental perceptions with regards to resource availability and resource governance and management, but their influence was not consistent across resource or governance issues. For instance, at the individual level, age significantly shaped individuals perceptions of resource governance and management regarding who controls access to natural resources. The youth and middle aged compared to elderly were less likely to perceive that the chief controls access to resources and were also more likely to perceive that the government controls access to resources than elderly. Household-level characteristics were found to have no influence on perceptions of who controls access to resources. Village resided in shaped perceptions of resource availability,

for every resource, and most aspects of resource governance issues. Village resided in had a stronger influence on range of individuals' environmental perceptions than individual and household level factors. Households which depended highly on natural resources were more likely to perceive shortages of resources and an increase in household resource use, the likelihoods of individuals perceiving community development forum and the community itself regulating access to the natural resources increased. It is clear that environmental perceptions vary within and between communities, and are shaped by the characteristics and circumstances of the individual, their households and the community they live in. Furthermore, the strength of influence of these determinants varies according to the particular resource and environmental governance issue concerned. The understanding and identification of factors that shapes individuals' environmental perceptions will be helpful for policy makers, as it could establish solutions that are grounded in rural communities' realities and their environmental perceptions.

DEDICATION

I wish to first dedicate this work to the Glory of God for seeing me through.

Secondly to my dad and mom, Allan and Grace, respectively.

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I am very grateful to Almighty God who has always been with me and blessed me in so many ways. I am also very grateful to my supervisor Professor Wayne Twine whose immense contributions, criticisms and unwavering commitment has made this research a success. I am also greatly indebted to him for allowing me to use his pre-existing data for my research and also to Carnegie Foundation, which funded the original fieldwork. It was indeed a wonderful experience to working with you. I gratefully acknowledge the members of my postgraduate research committee Professor Jason Marshal, Dr. Ute Schwaibold and Dr. Vivienne Williams for their valuable time and guidance during my proposal stage of this research. My sincere appreciation goes to all my friends, whose countless support helped and encouraged me during my studies at Wits University. I greatly thank Mr. and Mrs. Sakala, for their immense support throughout my stay in South Africa. Finally to my family, and specifically my parents. Thank you for your unwavering support, endless patience and infinite love. You are both amazing.

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CHAPTER 1

1.0 INTRODUCTION

1.1 Background

People in rural Africa depend heavily on various natural resources, and any decline in these, whether through restricted access or a diminishing resource base, is expected to affect local livelihoods adversely (Dahlberg, 2005). Competing interests over resources constitute a threat to access, availability and thus to livelihood security. This is not a new phenomenon, but due to factors such as democratisation and globalisation it has become an important issue for policy makers and researchers over the last decades (Dahlberg, 2005). One such situation is where tourism development, conservation interests and natural resource use by rural communities, often in areas managed under communal land tenure systems, are in conflict with one another (Wilshusen *et al*., 2002).

The environment is one's surroundings which includes one's social environment, for example the people and groups among which we live; one's physical environment, for example external physical factors like air, water and land; the living environment, for example all living organisms around us like plants, animals and microorganisms (Bell *et al.*, 2001). The environment is seen as the total complex of interrelationships making up the physical, biological and socio-political surroundings (Willers, 1996).

The relationship a person has with his or her environment is a complex one that is influenced by a variety of factors such as that person's culture and religion (both past and present), beliefs and values (Bell *et al*., 2001). All of these factors and especially the person's dominant value orientation (for example whether that person is more economically inclined or more socially inclined), will influence that person's perceptions, attitudes and ultimately his or her behaviour towards the environment, including how that person views his or her role in that environment (Bell *et al*., 2001; Kortenkamp & Moore, 2001).

All societies possess a substantial body of beliefs, knowledge and practices built around their day-to-day life experiences and their surrounding environment. This local knowledge is handed down from one generation to the next, but individual men and women in each generation adapt and add

to this body of knowledge in a constant adjustment to changing socio-economic circumstances and environmental conditions (Uddin & Foisal, 2007). From time immemorial, traditional communities have maintained a close and unique connection with the land and environment they live in (Ahamed, 2004). As stated, all societies possess a substantial body of beliefs and they are incredibly powerful in influencing how someone perceive the world around him or her, yet beliefs are created not on real facts. They are created not only based on culture, ethnicity, education but also on experiences, cultural norms and values. People's beliefs and value systems influence behavioural intensions (Dillion & Gayford, 1997).

A person's attitudes and understandings that reflect their habitual way of life, as well as their shared expectations, is what is referred to as perception (Uddin & Foisal, 2007). A person's perception can be shaped by several socio-economic factors at individual, household and village levels within a community. Socio-economic factors such as age, gender, occupation, income, area of residence, education, culture and beliefs are related to varying perspectives on the environment and they are possible determinants of environmental perceptions (Samdahl & Robertson, 1989; Nazarea *et al.*, 1998; Pollnac, 2000). However, rural people's perceptions of natural resources and their attitudes towards them will differ depending on how the environment and its resources fit into their individual livelihood strategies (Ashely, 2000). The livelihood strategy chosen by an individual or a household could have either positive or negative implications for the environment.

Most rural households are generally poor and significant differences occur within and among communities (Barham *et al.*, 1999; Shackleton & Shackleton, 2006). These differences are mostly overlooked because socio-economic stratification is less visible in rural areas. Nevertheless, strata do exist in these communities and are based on socio-economic factors such as level of education and employment, relationship to the privileged minority, age and gender (Smith *et al.*, 2001; Shackleton & Shackleton, 2006).

The state of the local environment is central to the well-being of millions of households in rural regions of developing countries, but little is known about environmental perceptions and concerns of residents in these areas (Hunter *et al.*, 2010). In addition, studies that compare local communities' perceptions of natural resource management regimes and further identify factors that explain these perceptions are not widespread (Mnguni *et al.*, 2013). More often than not, local communities' perceptions do not receive as much attention as they deserve (Guthiga, 2008). Much

research went into the importance of perceptions studies in terms of developing more successful conservation management plans and how people view the environment and their role in interaction with the environment (Dimitrakopoulos *et al*., 2010; Vodouhe *et al*., 2010). Although there have been many studies done on the environmental perceptions, there have not been many that have focused on the determinants of environmental perceptions. Therefore, there is a need to better understand the socio-economic-demographic factors that shape environmental perceptions of rural inhabitant at individual, household and village levels in this study. This is because the success of natural resources conservation depends on the support and perceptions of local communities.

1.2 Aim of the study

The aim of this study was to identify dominant environmental perceptions and their determinants at individual, household and village levels with a focus on environmental resource use, resource availability, and resource governance and management, among rural inhabitants in Bushbuckridge, South Africa.

1.3 Objectives, research questions and hypotheses

Objective 1

To determine local resource use patterns and dominant local perceptions regarding resource availability and resource governance and management among rural inhabitants.

Research question

What is the pattern of local resource use? How do rural people perceive resource availability and resource governance and management in their area?

Objective 2

To assess the relative influence of village, household and individual characteristics in determining environmental perceptions of an individual.

Research question

Among individual and household characteristics, and village resided in, which factors play a greater role in determining perception among rural inhabitants?

Research hypotheses

i. Gender has more influence in determining an individual's environmental perceptions than age.
ii. Household socio-economic status (SES) class has more influence in determining an individual's environmental perceptions than household size.
iii. The village that a person lives in influences an individual's environmental perceptions.

Objective 3

To explore the relationship between household resource use and individual perceptions of resource availability, and resource governance and management in rural communities.

Research question

How does household resource use influence individual's perceptions of resource availability, and resource governance and management?

Research hypothesis

Individuals from households which depend highly on natural resources are more likely to perceive shortages and that nobody controls access to the natural resources.

To achieve the objectives outlined, this research report is structured as follows: Chapter 2 presents literature review, including sub-sections on environmental perceptions, household natural resource use, access and control of natural resources, environmental change. Chapter 3 presents methodology, including description of the study area, data source and data analysis (methods that were employed to accomplish the objectives). Chapter 4 offers results and interpretations, on resource use, dominant environmental perception and on individual, household and village determinants of environmental perception. Chapter 5 offers discussion of these results and relates them to findings from other studies. Then, in light of these findings, Chapter 6 comprises the conclusions and implications of the study.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Environmental perceptions

As defined earlier, perception is a person's attitudes and understandings that reflect their habitual way of life, as well as their shared expectations (Uddin & Foisal, 2007). An individual builds up an understanding of the environment that is closest to him and makes decisions about how to respond and behave therein based on this understanding, previous experiences and his memory (Park, 1999; Hawcroft & Milfont, 2010; Chen *et al*., 2011). Social, economic, political and cultural settings influence the way in which people perceive their environment and the way they react to it (Orlove, 1980; Jones *et al*., 2011).

Human existence is mostly hinged on perception and most communities differ considerably in their perceptions about the environment and its resources (Ojong *et al*., 2013). An individual or group relies on perceiving as perception is one of the clearest instances of consciousness. For example, rural people have different perceptions of availability of resources in their communities; some individuals perceive that some resources are declining while others perceive the same resources to be adequate (Twine *et al*., 2003b). Another example of perception is that diverse groups may hold very divergent perceptions about a particular environment, about what should be defined as resources, and about who has or should have control over the resources of the environment (Blaikie, 2001; Nightingale, 2003). However, when assessing the way people operate within the environment, it is important to look at their perceptions and their actions towards the environment. It is also important to ask if and how different sections of the population differ with regard to environmental attitudes and behaviour (Scott & Willits, 1994; Bell, *et al*., 2001). One needs to understand a person's environmental worldview before one can even attempt to understand and know what influences his or her attitudes and behaviour towards the environmental (Brackney & McAndrew, 2001).

Various studies by social scientists have been done on the role of socio-economic status and individual characteristics in the changes of perceptions in connection with the environment (Rohrschneider 1988; Dunlap & Scarce, 1991; Jacobs, 2002; White & Hunter, 2009; Hunter *et al*., 2010). A shared element in findings from these studies is that socio-economic factors have a differential influence depending upon both individual conditions and the specific questions of environmental concern that are being explored (Anderson *et al*., 2007). People's attitudes towards the environment and the type of concern they develop towards the environment are associated with the degree to which they view themselves as interconnected with nature (Schultz, 2000). A person's perception of the environment is based on the relative importance that a person places on him or herself, other people, and the natural environment (Stern & Dietz, 1994). In other words, a person's attitude towards the environment is based on his or her general set of values. Schultz (2001), states that people with different value-orientations will ultimately have different perceptions of the environment.

The various ways in which people make use of their natural resources are always related to a multitude of social, cultural, and economic factors. Most studies concerning natural resource management highlight the importance of understanding and integrating local perceptions into modern conservation initiatives (Horowitz, 2001; Marcus, 2001; Walpole & Goodwin, 2001; Charnley *et al*., 2007; King & Peralvo, 2010; Owusu & Ekpe, 2011). The individuals and communities make use of their surrounding resources based on a variety of social and cultural factors that shape their perceptions of the environmental resources (Nazarea *et al.*, 1998; Chen *et al*., 2011). These factors can determine whether a potential resource is perceived as useful for extractive purposes or dismissed as a useless resource.

Perceptions of environmental resources determine not only how a resource is utilised, but also its relative value to the community (Cinner & Pollnac, 2004). The value that a community places on natural resources may have significant implications on how those resources are governed and managed. The value something has to an individual, household or community reflects the various fulfillments that can be gained from it (Pollnac, 2000). These fulfillments can range from utilitarian (e.g., a source of income or food) to aesthetics of the natural environment. These culturally defined standards which are often vital in understanding local approaches to environmental governance and management of natural resources. For projects that aim to promote sustainable uses of natural

resources, it is important to understand which resources a community places value on and which they do not. It is essential to understand factors influencing environmental perception prior to attempts to involve local people in community-based or co-management efforts (Quinn *et al*., 2003; Cinner & Pollnac, 2004). Resource management projects may need to either direct outcomes at local values or somehow change these values. Gaining an understanding of how local communities perceive natural resources on their environment, can allow resource managers to adapt and improve management strategies to reflect the needs and desires of the stakeholders (King & Peralvo, 2010; Dimitrakopoulos *et al*., 2010; Owusu & Ekpe, 2011).

However, it is also important to recognize that communities do not necessarily have a single perception regarding their natural environment. Social and economic factors can influence how individuals and households within a community perceive their natural resources. Socio-economic variables such education, age, occupation, area of residence, and gender are related to varying perspectives on the environment and its resources (Nazarea *et al.*, 1998; Pollnac, 2000). These different perceptions may help account for variances in behaviour related to environmental resource availability, and resource governance and management. However**,** variations in perceptions about environmental matters between ethnic groups have been found to persist even when demographic factors such as age, education, gender, residence and family size were held constant (Johnson *et al*., 2004 as cited in White & Hunter, 2009). With regard to physical context, consideration of village location dramatically improves the ability to predict environmental concerns, suggesting that location shapes environmental perception also (Hunter *et al.*, 2010). With regard to culture, gendered interaction with the material environment, men prioritize environmental issues with which they have more familiarity, such as overgrazing. Women, on the other hand, express primary concern with water quality and quantity (Hunter *et al.*, 2010). Hunter *et al.* (2010) noted in their study of environmental perceptions of rural South Africans that among people and communities around the world, there may actually be more commonality than differences with regard to social and environmental concerns.

Many social scientists have debated at length the factors influencing public concern for the natural environment (Rohrschneider, 1988; Dunlap & Scarce, 1991; Jacobs, 2002; White & Hunter, 2009; Hunter *et al.*, 2010). Other studies focus on religion and the ways in which spiritual orientation shapes environmental perceptions. For example, Biel and Nilsson (2005) found that religious

beliefs and values influence environmental concern, but only when the topic under consideration requires that individuals must reach to those values within the shaping of opinion (e.g. the moral dimensions of genetically-modified organisms). Traditional religious beliefs and cultural practices contribute in the conservation of resources through the ascription of spiritual powers to both animate and inanimate objects like rock, stream, tree, forest land (Eneji *et al*., 2012). For Africans, there is no clear separation between what is secular and what is sacred; everything and every act are looked upon in a religious and customary perspective as Africans view themselves as part of the environment (Taylor, 2002; Mkenda, 2010). Ignatow (2006) also contributed to this debate by arguing that environmental concern is shaped by both spiritual and ecological cultural models of nature-society relations and that by distinguishing between these two, we can better recognize the social sources of variation in concern for the environment. In this study Ignatow (2006), concluded that ecological and spiritual views of the relationship of nature to society are both genuinely, even though differently, environmentally friendly. It was further concluded that, both views are rooted in cultural models that contain elements that are objectively true.

Beliefs are very powerful in influencing how someone perceive the world around him or her. Though beliefs are powerful, they are created not on real facts. Beliefs are created not only based on culture, ethnicity, education but also on experiences, cultural norms and values. People's beliefs and value systems influence behavioural intensions (Dillon & Gayford, 1997). A person's behaviour is ultimately explained by considering his or her beliefs and since people's beliefs represent the information (be it correct or incorrect) they have about themselves and the world around them, it follows that their behaviour is ultimately determined by this information (Dillon & Gayford, 1997). It is often suggested that environmental attitudes and environmental behavior are related to people's values (Karp, 1996; Schultz & Zelezny, 1999; Stern, 2000). Values are typically conceptualized as important life goals or standards that serve as guiding principles in life (e.g., Rokeach, 1973). As such, they may provide a basis for the formation of attitudes and act as guidelines for behavior. That is, people consider implications of behavioral choices for the things they value. In relation to environmental problems, which often arise from a conflict between individual and collective interests, values may play an important role (Axelrod, 1994; Karp, 1996).

2.2 Household natural resources use

Rural South African populations are no exception to the global norm in which rural communities continue to rely heavily on local environmental resources for physical, financial and social security (Andrew *et al.,* 2003). This dependence on natural produce is widespread in South Africa and is evident in the variety of communal land products consumed as well as in the intensity of use by rural populations (Dovie *et al.,* 2002). The roles that natural resources play in rural livelihoods have been well documented in South Africa (Twine *et al*., 2003b; Shackleton & Shackleton, 2004; Paumgarten, 2005; Makhado *et al*., 2009). Evidence from such studies suggests that wild natural resources make an important contribution to rural livelihoods to meet domestic needs, to generate income, and to act as safety nets in times of hardship (Shackleton, 2005; Paumgarten & Shackleton, 2011). Natural resources provide ecosystem goods such as food (e.g. wild fruits, bushmeat, edible insects, and edible wild herbs), energy (e.g. fuelwood), medication (e.g. medicinal plants), building materials (e.g. thatching grass and poles for construction), materials for making domestic utensils and implements, ecosystem services (e.g. nutrient cycling, hydrological cycle, air purification) and recreational services. They also have cultural and spiritual values (Shackleton *et al*., 2007). Apart from that, some households cultivate one or more fields or gardens and some have livestock such as cattle, goats and chickens (Ashely, 2000).

Natural resources such as edible wild herbs, wild fruits and fuelwood, are used daily for domestic purposes in most households. Studies have indicated that over 80% of rural South African households may use these resources (Twine *et al.,* 2003b; Shackleton & Shackleton, 2006). Other natural resources such as bushmeat, edible insects, poles for houses, fences and kraals, reeds for weaving, thatch grass, wood for carvings and medicinal plants are used by fewer households. Poles for houses, kraals and fences and thatch grass are used once-off during construction of a homestead, and replaced after a long period of time, while wood for carvings and medicinal plants require special skills that are not possessed by all households.

A large number of rural households are still dependent on the natural resources for a range of basic living requirements. Few rural households do not use any natural resources whatsoever, although the degree of dependence on natural resources may vary considerably from region to region and household to households based on a number of factors including resource availability, accessibility, institutional control, population densities, employment levels, income levels,

availability of alternatives, and personal and cultural preferences (Twine *et al*. 2003b; Paumgarten & Shackleton, 2009). A study by Adhikari *et al*. (2004) in Nepal, also showed that each community has its own unique set of factors that affect the nature and level of their resource dependency. Other factors which may influence an individual's ability to derive various local natural resources from a given environment are gender, household size, education level, age of the household head and other contextual factors. Dovie *et al.* (2008) found that age and gender are very important factors that inform resource selection and use in many local communities. For instance, gender play a very important role in resource selection and use because differences in environmental perceptions between men and women are dependent on the specific environmental issue under consideration. As females or males may be more familiar with certain species of resources and their uses due to their regular contact with them in their livelihoods (Zent, 2009). There is much controversy surrounding the issue of gender. Some researchers argue that females, due to their role in communities are more involved in natural resource use and as a result hold more familiarity (Begossi *et al*., 2002) while other studies argue that males are generally more knowledgeable than women (Setalaphruk and Price, 2007; Stagegaard *et al*., 2002; Dovie et al., 2008). Although many studies have shown males to be more knowledgeable than females, this could be attributed to the way in which such studies are conducted, often resulting in a low level of female representation.

The demand for natural resources increases with wealth, making wealthy households the greatest users of natural resources (quantitatively) compared with poor households (Cavendish, 2000). Apart from using more resources, Twine *et al.* (2003) found that in the Mametja villages in the Limpopo Province of South Africa, wealthy households used a greater range of resources compared with poor households. This was attributed to the demand for more resources by bigger households, the availability of transportation (donkeys and trucks) and access to more manpower. However, poor households rely more heavily on natural resources for their basic needs than do wealthy households (McGregor, 1995; Cavendish 2000; Shackleton & Shackleton 2006). Although poor households may consume less natural resources in absolute terms, these resources often make up a substantially greater contribution to the household economy, i.e. value is greater, relative to total household income (Shackleton & Shackleton 2006). Wealthy households derive a smaller but important proportion of their household income from natural resources compared with poor households. This proportion is reduced by a number of additional sources of income (e.g. formal employment, livestock and farming) available to them. Shackleton and Shackleton (2006)

indicated that natural resources contribute on average 40% of the total income of poor households while the proportion contributed to wealthy households was 29%. Apart from this, poor households derive 20% of their income from the sale of natural resources compared with 5% by wealthier households.

2.3 Access and control of natural resources

Regarding access and control of natural resources, it is important to clearly distinguish between these two terms governance and management, because there is a strong connection between the governance and management of natural resources. Basically, governance is about who decides what to do, how those decisions are taken, who holds power, authority and responsibility, while management is about what is done in pursuit of resource conservation objectives, the means and actions to achieve such objectives (Borrini-Feyerabend *et al.*, 2012).

Most rural South Africans still live on communal land where land is registered in the name of the state. The communal lands constitute 12.2% of South African land with 83% of the rural population living in these areas (Isaacs & Mohamed, 2000). In the communal areas of South Africa, the typical character of land rights regimes emerge from socially and politically embedded within historically specific contexts and conjunctures (Cousins, 2007). The access to natural resources entails rights, and it is also primarily affected by social and political processes mirroring the dissemination of power in communities and societies (including dimensions such as gender and conflict), by market forces mirroring the dissemination of wealth, and by environmental forces which are frequently influenced by human activity (Lee *et al*., 2009).

Throughout Apartheid in South Africa, land was demarcated, allocated and substantiated via a mix of customary and governmental practices, in which tribal authorities, agricultural officers and magistrates all played a role. The occupancy for homesteads, and occasionally fields, was run officially through a permit system, demonstrated via the Permission to Occupy, or PTO certificate (Cousins *et al*., 2007). All such permit systems were officially forbidden after 1994, but have continued in some way in many areas. Today, land administration reform is both behind schedule and disputed, such that the authority for it is uncertain. In some instances local government officials are of the opinion that they can distribute land even though this is not legally the case (Cousins *et al*., 2007).

Land is utilised by different stakeholders for various purposes in order to meet a diversity of human and environmental needs. In most, instances when these stakeholders who are using land decide to utilise its resources towards different purposes, land use change occurs resulting in both detrimental and advantageous impacts (Chenge *et al*., 1998; Cousins *et al*., 2007). The problem of conflicts as a consequence of land use is more noticeable in communal areas because of tenure insecurity and lack of clearly defined property rights among others. For instance, tenure insecurity in communal areas leads to problems such as inadequate legal recognition of communal tenure systems, abuse by powerful elites and breakdown of the old permit-based system (Claassens, 2003). These problems result in conflicting claims to land and bitter disputes over authority. As reported by Cousins *et al*. (2007), development efforts including service provisions and infrastructure are severely restricted by lack of clarity on land rights and tensions that arise. The tensions normally occur between local government bodies and traditional authorities over the allocation of land for development such as housing, irrigation schemes, business centres, and tourist infrastructure (Cousins, 2007).

The access to and control of natural resources can lead to perceptions rural inhabitants have towards the environment. Access is a central criterion to assuring sustainable rural livelihoods. Natural resources become natural "assets" when access is assured, either through asset ownership or other forms of secure access and control (Lee *et al*., 2009). The access by the rural inhabitants to natural resources is important for sustainable poverty reduction. The livelihoods of rural people without access, or with very limited access to natural resources are vulnerable because they will have problems in obtaining food, amassing other assets, and recuperating after natural or market misfortunes or shocks (Lee *et al*., 2009; Paumgarten & Shackleton, 2011).

These natural resources are collected from the village commons. Communal lands are generally under communal or customary land tenure (Hunter *et al.,* 2005). In post-Apartheid rural South Africa, two parallel governance systems exist (Twine *et al.,* 2003a). The first includes traditional authorities, consisting of chiefs and their headmen or Induna. The second includes democratically elected officials, such as the municipality, wards, and community development forum (CDF) of which the main function is service delivery. The access to natural resources on communal land is mainly controlled by the traditional authority in addition to traditional affairs, although at times an overlap between the traditional authority, community development forum (CDF), and local

government occurs causing confusion (Dovie *et al.*, 2005; Cousins, 2007). In most rural areas including communal lands, apart from collecting natural resources, livestock grazing is the primary land-use and contributes in some way to most household needs (Ashely, 2000).

The rules that govern access to natural resources and how they are managed vary greatly. Access to some resources is primarily held by individuals, while access to other resources may be shared across larger groups, including the state, and some resources are effectively not held by anyone (Lee *et al*., 2009). As stated, traditional authorities were responsible for controlling access to natural resources on communal lands. They enforce laws concerning the harvesting of resources, such as preventing the cutting of live trees, and violation of these laws was punishable by a fine (Twine *et al.*, 2003a).

The access to and control of natural resources by locals and outsiders differ between villages (Twine *et al*., 2003a). In this case an outsider refers to somebody who does not belong to a particular village. The harvesting of communal resources by outsiders in rural South Africa was regarded as being a problem in villages (Twine *et al*., 2003a). The degree of concern over this harvesting differs, depending on the resource, stakeholder group, and village (Twine *et al*., 2003). Most local people believe that they are not allowed to cut live trees that are useful to humans, because of their valuable fruits. For instance, large fruiting trees such as marula trees (*Sclerocarya birrea*) in the communal lands are locally protected by customary practices such traditional norms (e.g. fruits must only be collected from the ground, and not from the tree) as indicated by Shackleton & Shackleton, (2002). Male marula trees are considered of no use because they do not bear any fruits and that the prohibition apply solely to female marula trees (Shackleton & Shackleton, 2002; Twine, 2005). There was a widespread perception that traditional norms are not followed so much, for example, by outsiders ignoring the rules, especially Mozambicans (Shackleton & Shackleton, 2002; Twine *et al*., 2003a). This shows that local people have beliefs which have manifested very quickly over time regarding the cutting of live trees of which the same beliefs have not manifested to outsider, as the results they tend to ignore them.

Traditional authorities are theoretically still responsible for management of natural resources in their communities, and some still do so effectively. The issue of traditional authorities involves a change in perception of the people under their authority. A common perception across villages is that people no longer recognized the authority of traditional structures, whether they still

functioned or not (Twine *et al.*, 2003a; Kirkland *et al*., 2007). It is also widely believed that the coming of democracy in South Africa showed the end of the rule of traditional authorities, especially among the youth because the traditional authorities no longer exercised the same level of control over resource harvesting as they had in the past (Twine *et al.*, 2003a). This was frequently attributed to the perception that people no longer needed to respect the traditional authorities due to democracy and freedom following the 1994 elections in South Africa (Twine *et al.*, 2003a). It is clearly shown that the lack of recognition of tribal authority is attributed to much more with what was experienced in the past. The close corrupt ties between traditional leaders and the former government bred widespread mistrust and suspicion of tribal leadership both during and after Apartheid (King, 2005). It is clear that the erosion of traditional authority powers over resource harvesting on communal lands presents some severe problems particularly for law enforcement (Cousins *et al*., 2007).

Individual, household or group users of land and natural resources in communities are socially differentiated along various dimensions; wealth, political authority, class, gender, age, ethnicity and so forth. There are often competing interpretations of principles governing claims and use of natural resources on communal land and much of the contestation occurs over definitions and interpretations (Peters, 2002). In or outside the household, particular gender domains can be distinguished. Lastarria-Cornhiel (1997), observed that to a large extent gender together with class determines an individual's opportunities, standard of living, aspirations, access to resources, status in the community and self-perception. Gender also is one of the basic determinants of how work and responsibilities are assigned among people (Lastarria-Cornhiel, 1997). As an example, women are often constrained in accessing and controlling land and forest resources, due to the construction of gender characteristics within households (Agarwal, 1997; Goebel, 1998). Gender was thus found to be a strong predictor of environmental perceptions (Lindemann-Matties, 2002).

2.4 Environmental change

Degradation of the natural environment has become the topic of increasingly intense research over recent decades. Human consumption of natural resources is generally identified as the key link between human behaviour and loss of quality of the natural environment (Stern *et al.,* 1997). In rural regions of the world's less developed nations, environmental change has immediate and direct impacts on millions of households since natural resources are frequently vital in meeting basic living necessities (Shackleton & Shackleton, 2000; Koziell & Saunders, 2001; Shackleton & Shackleton, 2004).

Land use change is one of the main drivers of environmental change or degradation. It influences the basic resources of the land. Changes in land use may degrade the neighborhood environment as a new neighborhood facility occupies land that may have been previously common land used for grazing and fuelwood/fodder collection, or private land used for agricultural purposes (Barber *et al.*, 2003). The area of common land declines as the number of facilities increases (Shivakoti *et al.,* 1999). The causes of land degradation can be divided into proximate causes and root causes or underlying driving forces (Geist & Lambin, 2004). The immediate causes are those factors that directly affect the land, which is the land management of agricultural activities, infrastructure, harvesting of wood products, and droughts and fires, whereas indirect drivers constitute demographic, technological, economic, institutional, political and cultural factors (Geist & Lambin, 2004).

Actual environmental degradation is probably an important determinant of individuals' perceptions of environmental degradation (Barber *et al.,* 2003). Many factors are likely to influence whether and how individuals perceive environmental degradation. The personal experience of actual environmental degradation is likely to be an important factor. When the environment actually deteriorates, individuals and households are probably more likely to perceive environmental degradation relative to residents of areas where the environment has improved or stayed the same (Foster, 1999; Barber *et al.*, 2003). The extent also to which individuals interact with the environment is likely to influence their perceptions of environmental degradation (Foster, 1999; Barber *et al.*, 2003). For example, women and children, who are most often responsible for collecting fuelwood and water on communal land, may be more likely than men to perceive dwindling wood and water resources because their collection times have increased. If these

resources are depleted, the burden fall disproportionately on women and children, since they are traditionally the ones in charge of collection.

A study on environmental change in Bushbuckridge by Erasmus *et al*., (2011) indicated that historical trends in Bushbuckridge show that settlements are expanding, with an increasing corresponding footprint around each village, where woodland resources are depleted. People can and do adapt to environmental change, but projecting current trends in the changes that we observe, combined with increased unpredictability of rainfall, threatens to decouple the age-old interdependencies in the this cultural landscape, and present inhabitants with conditions beyond their adaptation capacity.

CHAPTER 3

3.0 METHODOLOGY

3.1 Description of the study area

This study was conducted in Bushbuckridge, which is a local municipality in Mpumalanga Province, South Africa (Figure 1). Bushbuckridge is located in the South African Lowveld (31^0 0' – 31^0 35' E; 24^0 30' – 25^0 0' S). Covering approximately an area of 2,417 km^2, Bushbuckridge has 65 settlements and a high population density of about 650,000 with a mean house hold size between 6-7 individuals (Shackleton & Campbell, 2007). The inhabitants of Bushbuckridge are predominantly Shangaan and Sotho speaking people.

As it is the case in most rural South Africa, Bushbuckridge region is a predominantly rural area which is characterized by a high unemployment rate, high level of migrant labour (especially males), high human population, and high reliance on remittance, social grants and natural resources as primary source of income for most households (Shackleton *et al*., 2000; Hunter *et al.,* 2005; Ifegbesan *et al.,* 2009). Relatively few individuals are involved in subsistence agriculture because agriculture is mainly on small-scale arable plots, home gardens and road verges that contribute significantly to rural livelihoods (High & Shackleton, 2000).

The region is semi-arid with an annual rainfall gradient of 550 mm in the east to 700 mm at the foot of the Drakensberg escarpment in the west (Shackleton, 2004). The mean annual temperature is approximately 22ºC (Hunter *et al.* 2005). The natural vegetation is predominately broad-leaf savanna woodlands or bushveld (Lowveld) on granitic soils (Shackleton, 2004). The tree stratum is dominated by members of the Combretaceae (*Terminalia sericea, Combretum collinum,C. hereroense, C. zeyheri and C. apiculatum*) and Mimosaceae (*Acacia nilotica, A. gerrardii, A. atax-acantha, A. caffra, A. sieberana, Albizia harveyi, Albizia versicolor* and *Dichrostachys cinerea*), although local dominance varies considerably (Shackleton, 2004).

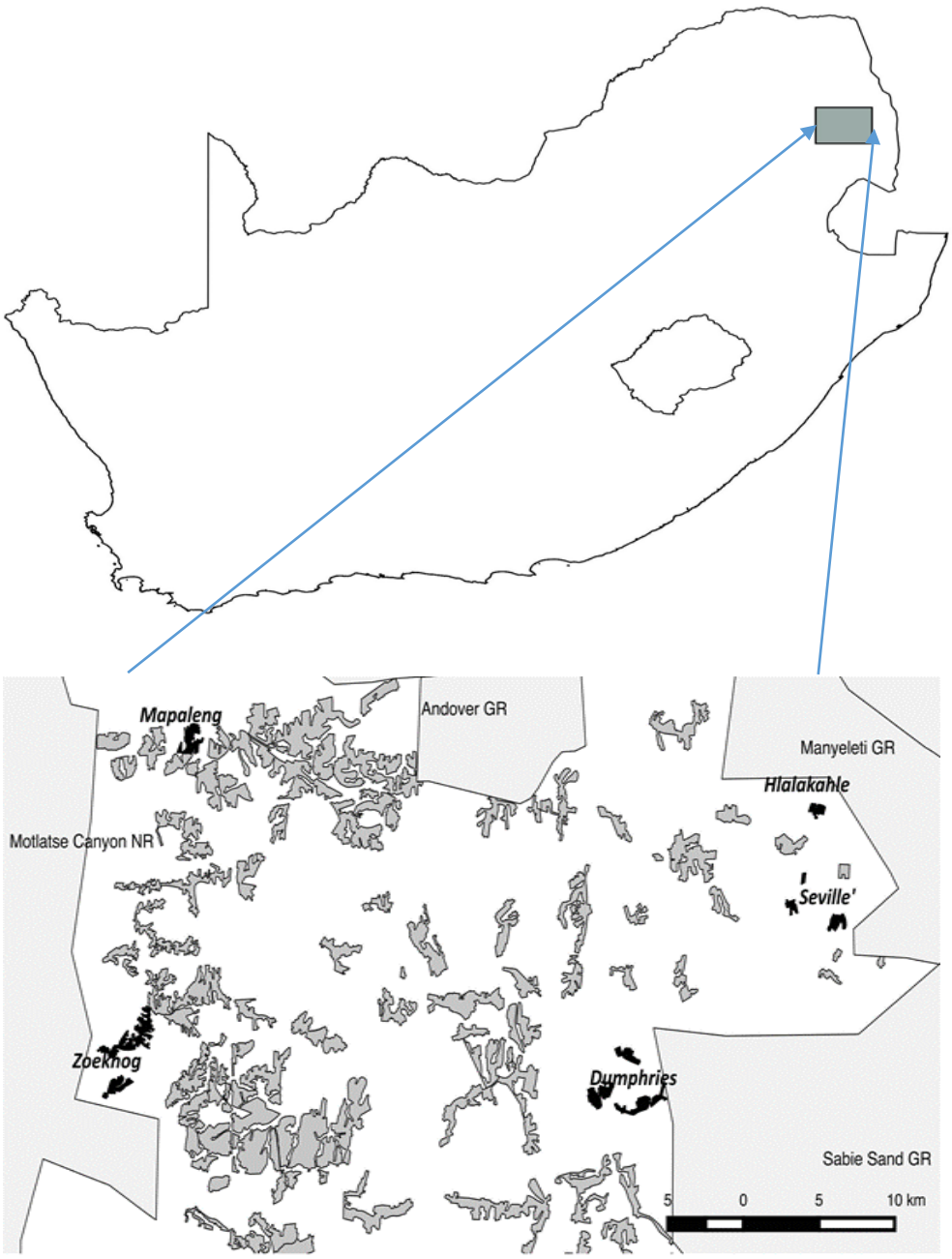

Figure 1: Location of study villages in Bushbuckridge on a map of South Africa.

3.2 Description of the study villages

The study focused on five villages namely: Dumphries, Hlalakahle, Mapaleng, Seville and Zoeknog. As reported by Hansen (1998), an account for the differences between study villages is as follows;

Dumphries

- The village is situated in the eastern dry part of the district.
- There were very few livestock in the village and unemployment rate was high.

Hlalakahle

- Also situated in the dry part of the district in close vicinity of a fenced game reserve.
- Considerable number of livestock: cattle, goats and donkeys.
- Relatively high number of indigenous houses with thatch roofing and indigenous wood for construction.
- Deep gullies near the river towards the game reserve, to the east.
- Woodlands in sight seemed fairly degraded.

Mapaleng

- Sizable village close to the tar road and Acornhoek (one of the bigger towns in the district).
- Electricity available in this village.
- Many people employed in Acornhoek nearby.
- Surrounding land use; plantation west of the villages and practically no indigenous trees.
- Very few indigenous build houses.

Seville

- Dense indigenous woodland surrounding the village.
- High number of livestock.
- Many indigenous houses and very big household stands. Low population density.
- Surrounding land use: Game Reserve (Manyeleti).

Zoeknog

- Situated at the foothills of the Drakensberg escarpment
- High population density with household stands very close together
- Very little indigenous vegetation since a considerable area is occupied by forest plantation, a sawmill and a coffee-project.
- A considerable number of the villagers was employed at these places.
- East of the village were deep clefts with indigenous vegetation but this was reported as being inaccessible because of the clefts.
- People depended very much on wood from the plantation for both construction and firewood thus use of indigenous wood seemed less than in the other visited villages.
- Very few traditionally build houses.
- People's perception of indigenous fruit/trees included exotic fruits like mango and guava which can be found on the communal lands.

3.3 The choices of indigenous resources

The study focused on the following indigenous resources: fuelwood, edible wild herbs, wild fruits, edible insects, bushmeat, traditional medicine, building poles, fence poles, wood for carvings, grass and twigs for brooms, thatching grass for roofs, reeds for mats, grazing land for livestock, cultivating land for crops. The choice of these indigenous resources was based on previous studies which indicated that these resources are known to be widely used by most rural households in the region (Twine *et al*., 2003b; Dovie *et al*., 2005, Shackleton & Shackleton, 2006). For example, fuelwood is one of the most used energy sources used for cooking and warming during winter and provides light in the evenings (Kirkland *et al*., 2007).

3.4 Data Source

The study was based on pre-existing unanalysed data that were collected in 2006 among the inhabitants of the rural region of Bushbuckridge in South Africa and the human ethics clearance number was M10301. The data collected were made available to this study by principle investigator, Professor Wayne Twine. It is important to state that not all pre-existing unanalysed data which were provided were analysed for this study because the database had data which were not relevant to achieve the objectives of this study. This section explains how the primary data

necessary to achieve the objectives of this study were collected. The semi-structured questionnaire was the main research instrument used to elicit both qualitative and quantitative data from the rural inhabitants (see Appendix 1). This is because questionnaires are an efficient, traditional means of collecting data about a population and is the most commonly used in rural research (Chambers, 1983). This is probably the best method available to the social scientist interested in collecting primary data in order to describe a population that is too large to observe directly (Babbie, 1995). They focus on finding trends and patterns and allow hypothesis testing on a large scale and formulation of predictive models (Bernard, 2002). They can be administered face-to-face, via the telephone or posted to respondents. The former was used in this study to allow for more open ended questioning and probing. The interviews were semi-structured as many of the questions were open-ended. Complex ideas, and perspectives are difficult to capture through predetermined terms and measurements based on the interviewer's perceptions. A more semi-structured approach allows for flexibility in responses, explanations and probing to gain clarification, and more accurate information (Saunders *et al*, 2003).

Interviews were conducted in the local language by fieldworkers who were locally recruited and trained. A sample of three hundred (300) rural households was randomly selected from across five villages (Dumphries, Hlalakahle, Mapaleng, Seville and Zoeknog) stratifying respondents by gender and three age groups as follows; youth (18-35 years), middle age (36-50 years) and elderly (above 50 years). The villages were divided into 4 roughly equal sections and a number of streets were selected per section. Households were randomly selected by approaching every third household in a street, alternating between left and right hand sides of the road. This was done until the required number of respondents per age/gender profile were reached per village. Twenty (20) questionnaires were administered per combination, giving 60 interviews per village.

All the primary data were collected by means of a survey of rural households in the study area. A household was defined as a co-resident group of persons who share most aspects of consumption, drawing on and allocating a common pool of resources to ensure their material reproduction and well-being (De Haan, 2006). The sampling unit in the survey was the household, while the unit of observation or respondent was an adult member of the household of at least 18 years and above in order to achieve a required number of respondents per age/gender profile per village.

The data which were collected at individual-level were the respondent's gender and age categories. This information was recorded to obtain biographical background of the respondents. At household-level example of data which were collected was the number of permanent household members, proportion of members with permanent and temporary employment, number of social grants received and also household natural resources use patterns. At village level, there were little data which were collected but it was used only to determine village influence, not on casual relationships.

The respondents were also asked questions regarding natural resource use patterns and dominant local perceptions of resource availability and resource governance and management in their communities. Data on household natural resource use patterns were collected. For instance, the details of resource use including frequency of use (every day, 1-3 times/week, 4-6 times/week, less often and never used) in last 12 months were collected on the following consumable local natural resources; edible wild herbs, wild fruits, edible insects, bushmeat, fuelwood, and tradition medicine. Other natural resources used or owned by households were non-consumable natural products and the details of frequency of use were not collected as most of these resources are known to be used once-off during construction, and replaced after a long period of time. The resources were wooden carvings, fence poles, buildings poles and thatched roofs. Non-consumable natural products such as grass and twigs brooms have a life span of less than a year while reed mats have a mean life span of 1.7 years (Twine *et al*., 2003b).

Data on individual's perceptions of resource availability were collected. As such, respondents were asked if the local availability of a given resource was sufficient or insufficient (e.g. edible wild herbs, edible insects, wild fruits and fuelwood). The data on perceptions of respondents on resource governance and management were collected, for example, whether it was necessary to get permits to harvest a particular local resource as much as they want from the bush and who gives them permits to harvest the local natural resources (e.g. bushmeat, wet fuelwood, tradition medicine, fence poles, building poles and wood for carvings). Further, individuals' perceptions on who controls access to the natural resources were also studied, for instance if it was the chief, the community development forum (CDF), government (e.g. nature conservation authority), the community itself, or nobody.

With regards to the provided database, it was observed that most of the responses to questions in the questionnaire were converted into a binomial yes/no response, for instance, for the question on access and control of natural resources, whether it is necessary to get permits to harvest natural resources from the bush. For some questions, possible responses were in four Likert scale categories: strongly disagree, disagree, agree and strongly agree. For the purpose of tractability in this study, especially for the multivariate models, the first two response categories in such cases, strongly disagree and disagree were converted to a "No'' response while the last two response categories agree and strongly disagree were converted to a "Yes'' response. This is why this study used quantitative approach to study the relationship between environmental perceptions and variable which contribute in shaping environmental perceptions, despite many perceptions studies are done using qualitative approach.

There were various limitations with regard to this research study. This study's scope was limited to respondents' environmental perceptions disaggregated by individual and household level characteristics, and village resided in. Thus, it did not cancel out the possibilities that other factors may shape one's environmental perceptions. Therefore, it is recommended that the best methodology of assessing household socio-economic status (SES) class should incorporates a number of criteria relevant to the research area. It is important for factors such as individual's level of education, occupation and village geographic factors (such as village population size relative to communal land, remoteness, actual environmental conditions, current vegetation type and cover etc.) be included in a follow-up research about environmental perceptions since it will strengthen the validity and understand more fully the complexities of factors that might shape individual's environmental perceptions. It is also important for future studies in their analyses to use Likert Scale data for a more nuanced analysis of environmental perceptions.

3.5 Data Analysis

This study concentrated on evaluating dominant environmental perceptions and their determinants at individual, household and village levels with a focus on environmental resource availability, resource use, and resource governance and management. As stated earlier, both qualitative and quantitative data were collected for the study and most of the data were categorical. Household size ranged between 1 and 21 permanent household members with an average of 5.5 members and it was categorised into small (1-5 persons), medium (6-10 persons) and large (11-21 persons)

households. In this study, socio-economic status (SES) class of households was determined in terms of number of income sources (permanent and temporary employments and number of social grants). As grants are lower than most wages, weighting was done by dividing the number of social grants by two for households receiving social grants. Total number of income sources was then calculated by adding the full number of total permanent and temporary employment and the halved number of social grants. The calculated socio-economic status (SES) of households ranged between 0 and 8.5 income sources and it was then categorized into three classes poor (0.0-2.5), middle (3.0-5.5) and wealthy (6.0-8.5).

The data were coded and entered into Microsoft Excel (MS Excel 2010) and thereafter analysed using a Statistical Package for Social Sciences (SPSS) Version 22.0. Data were analysed using both descriptive and inferential statistics. Descriptive statistics was employed to make data more understandable by describing the frequencies, percentages and cross tabulations from categorical data. Cross-tabulations using Pearson's Chi-Squared test was used to determine significant relationships between pairs of categorical variables. To determine resource use patterns and dominant local perceptions regarding resource availability and resource governance and management among rural inhabitants, the individual data were pooled to provide information about dominant environmental perceptions before disaggregating it into individual and household characteristics and village resided in. To assess the relative influence of individual and household characteristics and village of residence in determining individuals' environmental perceptions with regards to resource availability, and resource governance and management, Multinomial logistic regression (MLR) was used. Multinomial logistic regression was an appropriate method as dependent variables were binary and the independent variables (except village) were ordered categorical variables. Therefore, most of the MLR models were ran for each dependent variables to determine which independent variables significantly influenced individuals' environmental perceptions.

When assessing the influence of household resource use (consumable and non-consumable resources) on perception of resource availability, the effect of one variable (frequency of consumable resource use) by comparing the effect of different frequencies of use categories relative to daily use to determine the effect on perceptions of consumable resource availability was assessed using multivariate analyses. The influence of household resource use on perception of

non-consumable resource availability was assessed using bivariate analyses, as the dependent variable was perception of non- consumable resource availability (yes/no) and the independent variable was own/use non-consumable natural product (yes/no). When assessing the influence of household resource use on perception of resource governance and management, a continuous variable known as household resource use was created combining both consumable and non-consumable resources. Firstly, the resource use score per resource per household of consumable resources was assigned 0 = Never, 1 = less often, 2 = 1-3 times/week, 3 = 4-6 times/week, 4 = every day and the assigned scores per resource use per household were divided by 4 giving score range from 0 to 1 of each resource per household, with 0 representing resource never used by a household and 1 representing the maximum frequency of resource use by the household which was every day. Secondly, the total scores of consumable resources per household were then added to household resources use binary scores (yes = 1 or no = 0) of non-consumable resources per household. Thirdly, the total scores of household resource use of both consumable and non-consumable resources per household were then divided by 12 which was the total number of resources giving the household resource use variable range of scores between 0 and 1, with 0 representing no natural resources used by a household and 1 using all resources daily by a household. Lastly, to assess the influence of household resource use on resource governance and management with respect to who controls access to the natural resources, logistic regression was computed with household resource use as a continuous independent variable and each regulator nobody, chief, community development forums (CDF), government and community as dependent variables (binary). Hosmer and Lemeshow test for goodness of fit for models was larger than 0.05 level of significance, indicating that the data fitted well on the models.

CHAPTER 4

4.0 RESULTS

4.1 Structure of the results

The study investigated dominant environmental perceptions and their determinants at individual, household and village levels with a focus on environmental resource use, resource availability, resource governance and management. The results are presented according to various topics and this section commences with the findings of resource use and then of respondents' dominant environmental perceptions. Thereafter, a presentation of the findings on the influence of individual, household and village determinants on environmental perceptions. The section concludes with the findings on the influence of household resource use on environmental perceptions with regards to resource availability, and resource governance and management.

4.2 Resource use

As shown in Figure 2, of the twelve local natural resources considered, fuelwood (98.7%), edible wild herbs (98.3%), grass and twigs for brooms (97.7%), reed mats (95.3%) were the most widely used resources in households. Building poles (45.7%), thatch for roofs (40.3%) and bushmeat (35.3%) were the least used resources. These results clearly show that fuelwood was the most widely used resource and bushmeat was the least used resource.

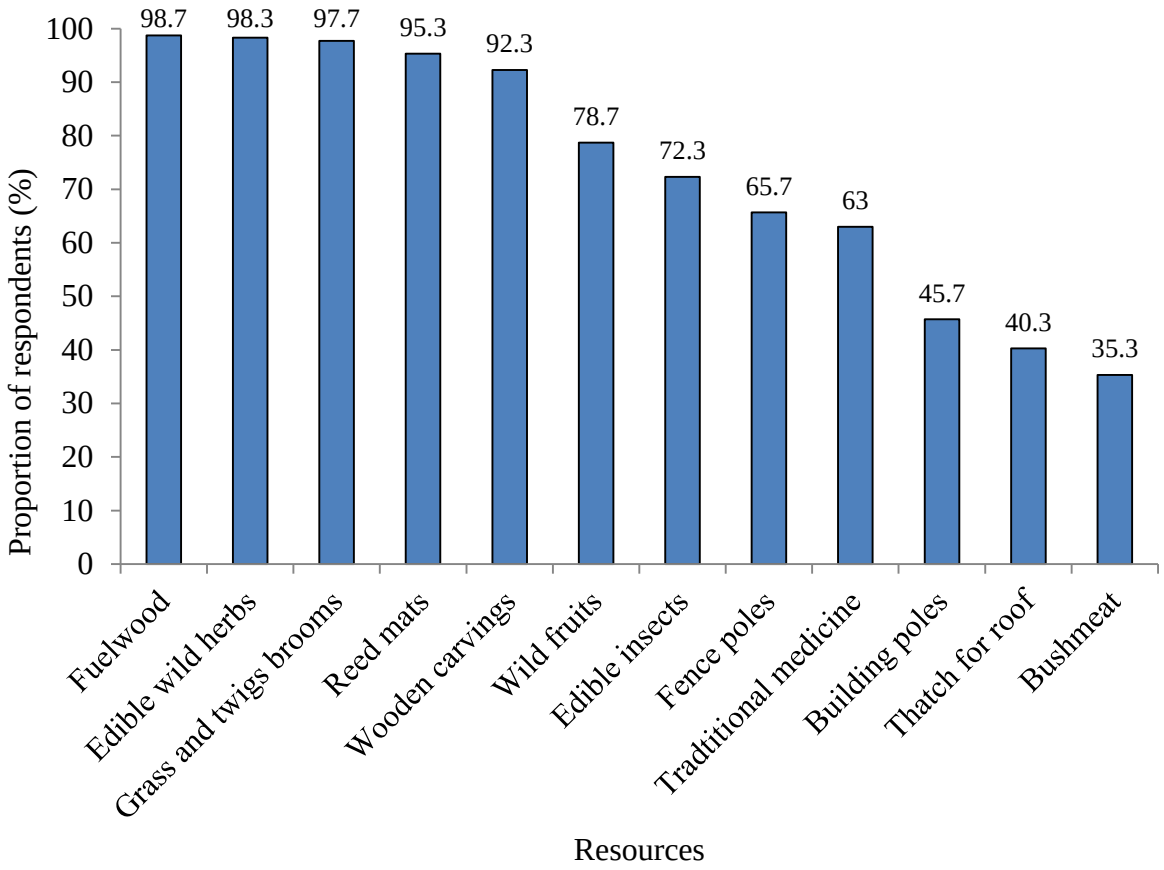

Figure 2: Proportion of respondents indicating natural resources used by their households

The respondents were asked to state the frequency of use of consumable resources by their households in the last 12 months. The consumable resources were fuelwood, edible wild herbs, wild fruits, edible insects, traditional medicine and bushmeat. The respondents used the consumable natural resources in their households at these frequencies: every day, 4-6 times/week, 1-3 times/week, less often or never (Figure 3). A comparison of frequency of use of consumable resources showed that larger proportions of households consumed fuelwood every day compared to other resources while edible wild herbs, wild fruits and edible insects were mostly consumed 1-3 times/week. The majority of user households used traditional medicine and bushmeat less than once a month. None of households indicated that they consumed bushmeat every day.

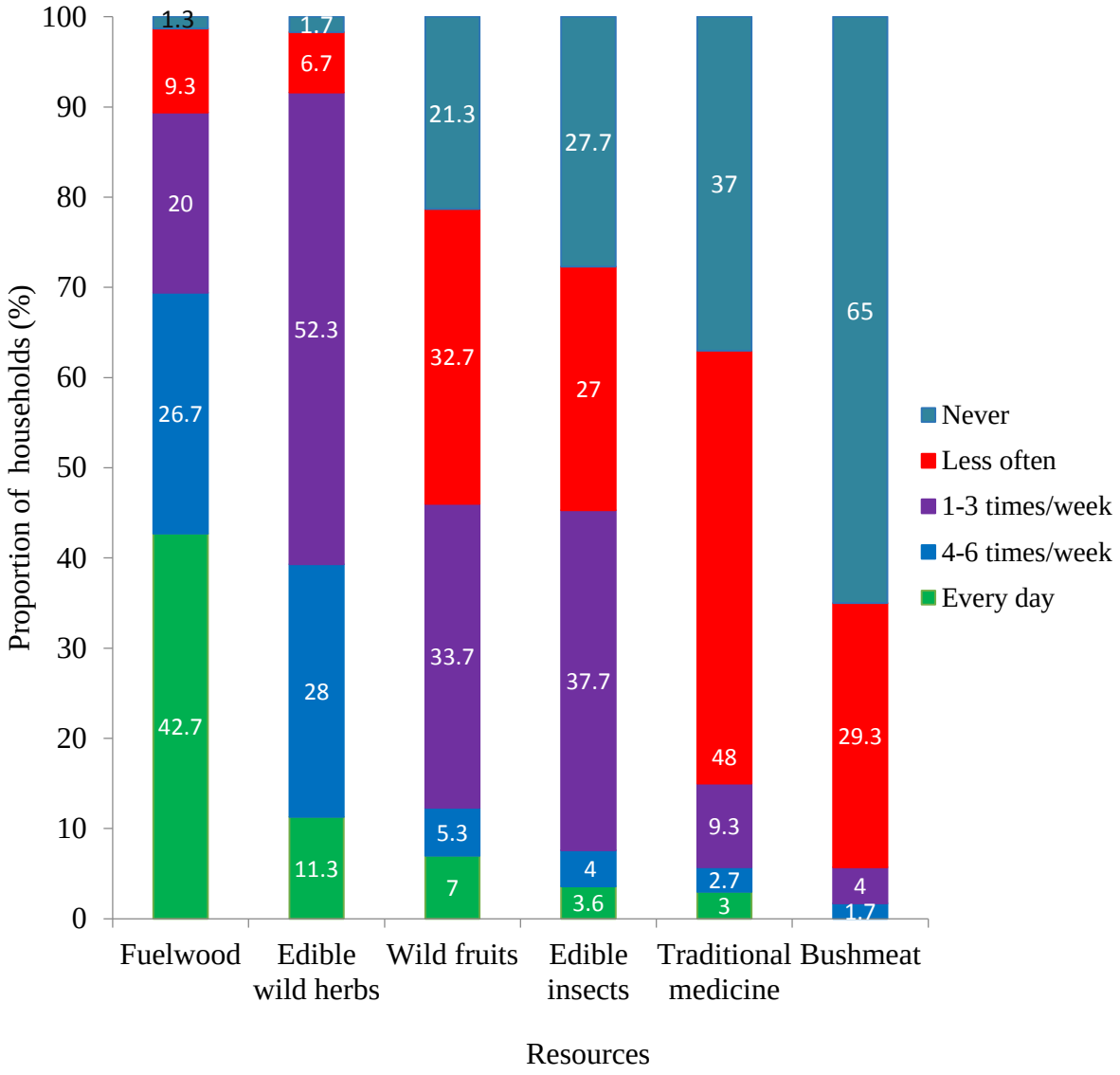

Figure 3: Proportion of households indicating frequency of use of consumable natural resources

4.3 Dominant environmental perceptions

4.3.1 *Resource availability*

The respondents were asked to state their perceptions of local availability of natural resources. As shown in Figure 4, the majority of respondents perceived local availability of edible wild herbs, traditional medicine, edible insects and wild fruits to be adequate. By contrast, less than a third of respondents indicated sufficient local supply of building poles, bushmeat and fuelwood.

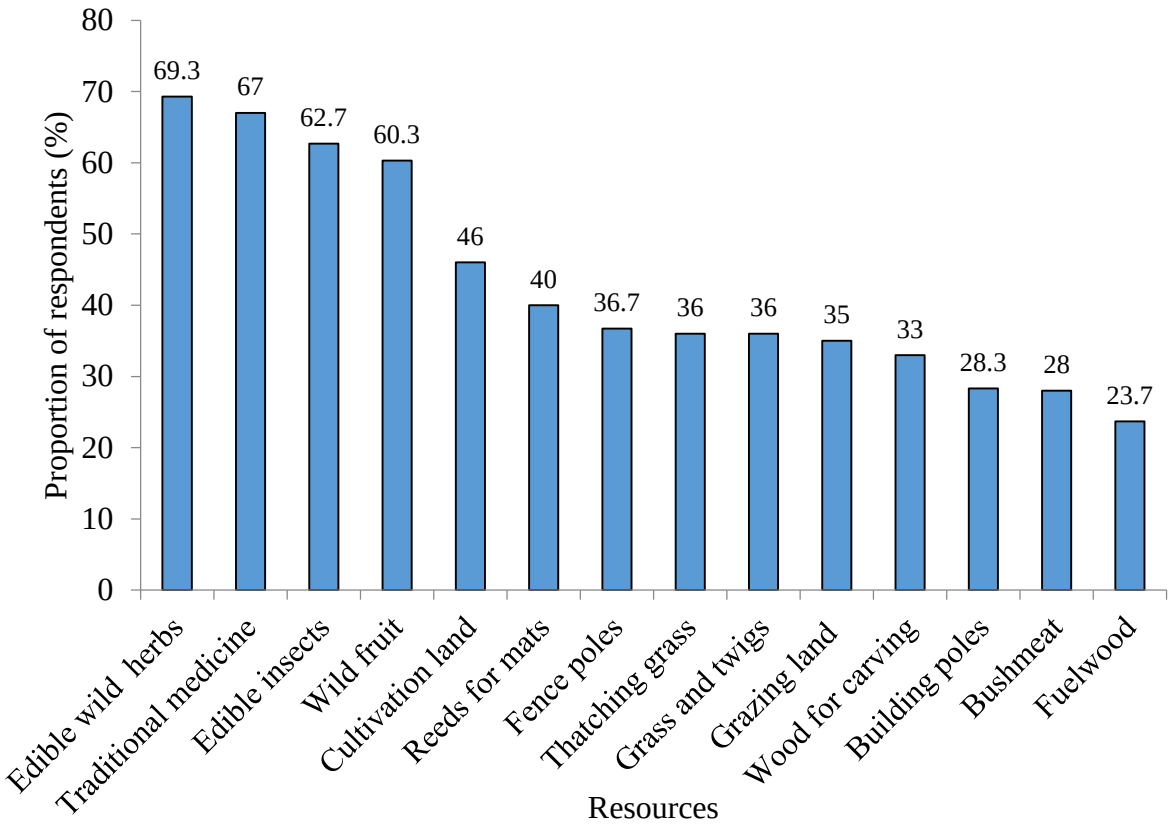

Figure 4: Proportion of respondents who perceived sufficient availability of natural resources

4.3.2 *Resource governance and management*

The respondents were questioned to state their perceptions if it was necessary to get permits to harvest natural resources (bushmeat, traditional medicine, wet fuelwood, fence poles, building poles, wood for carvings and furniture) and that permits were issued by either the chief or nature conservation authorities. As shown in Figure 5, less than half of respondents felt that it was necessary to get permits for resource harvesting, except in the case of traditional medicine. It was also dominantly perceived by 82.3% that the chief was the major issuer of harvesting permits compared to nature conservation authorities (38.7%).

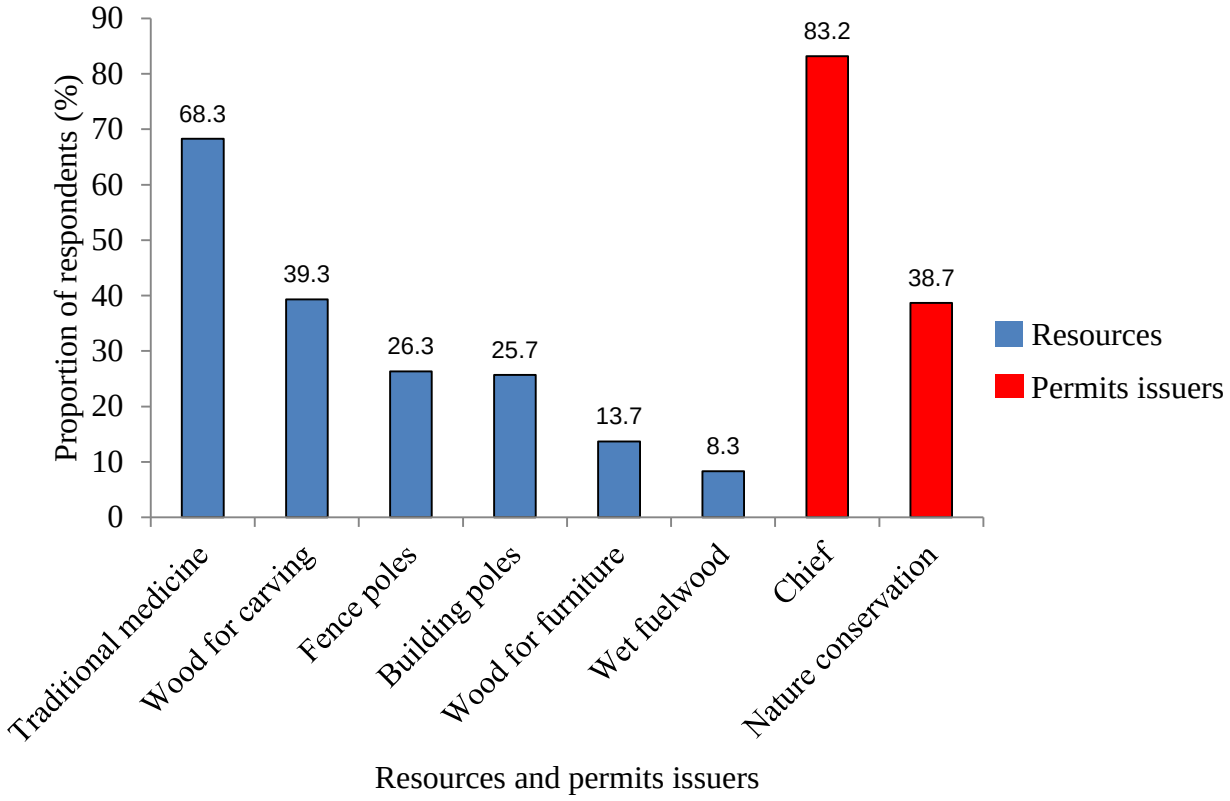

Figure 5: Proportion of respondents who perceived that it was necessary to get permits to harvest natural resources and that permits were issued by either the chief or nature conservation authorities

In addition, the respondents were also asked to state their perceptions of who controls access to natural resources. As shown in Figure 6, the majority of respondents (81.7%) dominantly perceived that the chief controls access to natural resources followed by the government (39.7%), community development forum (CDF) (9%), nobody (3.3%) and the community itself (1.3%). These results clearly show that the chief was dominantly perceived as the person who controls access to natural resources and the community was perceived to have least control access to the natural resources.

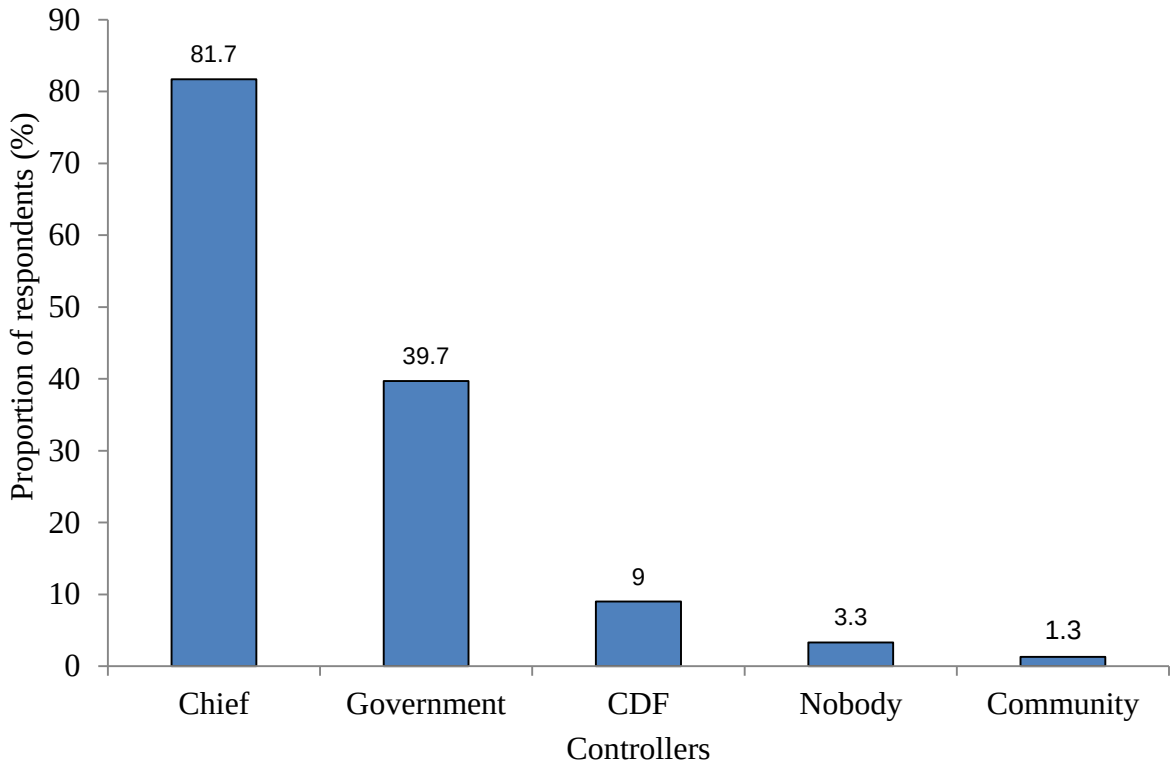

Figure 6: Proportion of respondents indicating who controls access to the natural resources

4.4 Individual, household and village determinants of environmental perceptions

4.4.1 *Resource availability*

The results showed that individual-level characteristics had no significant influence on determining individual perceptions of resources availability, except in the case of grass and twigs for brooms (Table 1). For these resources, a significantly greater proportion of males perceived sufficient availability of grass and twigs than females ($\chi^2 = 2.836$; $p < 0.05$), and it was also noted that there was a near-significant ($\chi^2 = 3.385$; $p < 0.1$) trend in decreasing perception of sufficient availability of these resources with increasing age. At household-level, household size had no significant influence in determining individual perceptions of local resource availability with the exception of bushmeat (Table 2). A greater proportion of large households perceived that bushmeat was sufficient compared to small and medium households ($\chi^2 = 9.088$; $p < 0.05$). Household socio-economic status (SES) class had no significant influence in determining individual perceptions of local resource availability, with the exception of building poles (Table 2). A substantially smaller proportion of medium wealth households perceived building poles to be sufficient, compared to poor and wealthy households ($\chi^2 = 6.812$; $p < 0.05$). At village level, the village resided in had a significant influence in determining individual perceptions of resource availability (Table 3). Significantly greater proportions of respondents in Mapaleng village consistently perceived sufficient availability of all resources with the exception of fuelwood, grazing land and cultivation land. A significantly greater proportion of respondents in Zoeknog village perceived sufficient local availability of fuelwood compared to those in other villages. Seville village had significantly greater proportions of respondents who perceived sufficient local availability of grazing land and cultivation land.

Table 1: Proportion of respondents (%) perceptions indicating sufficient availability of resources disaggregated by gender and age group (frequency in brackets)

	Gender				Age groups				
Resource	Male (n=150)	Female (n=150)	χ^2	p-value	Youth (n=100)	Middle (n=100)	Elderly (n=100)	χ^2	p-value
Edible wild herbs	73.0 (110)	65.3 (98)	2.258	0.133	66.0 (66)	72.0 (72)	70.0 (70)	0.878	0.645
Wild fruits	58.0 (87)	62.6 (94)	0.682	0.409	62.0 (62)	60.0 (60)	59.0 (59)	0.195	0.907
Edible insects	63.3 (95)	62.0 (93)	0.057	0.811	63.0 (63)	61.0 (61)	64.0 (64)	0.199	0.905
Bushmeat	28.7 (43)	27.3 (41)	0.066	0.797	27.0 (27)	32.0 (32)	25.0 (25)	1.290	0.525
Fuelwood	20.7 (31)	26.6 (40)	1.495	0.222	23.0 (23)	25.0 (25)	23.0 (23)	0.148	0.929
Traditional medicine	65.3 (98)	68.6 (103)	0.377	0.539	71.0 (71)	69.0 (69)	61.0 (61)	2.533	0.282
Grass and twigs	40.6 (61)	31.3 (47)	2.836	*0.046*	41.0 (41)	38.0 (38)	29.0 (29)	3.385	0.092
Fence poles	26.6 (40)	30.0 (45)	0.410	0.522	27.0 (27)	31.0 (31)	27.0 (27)	0.525	0.769
Building poles	37.3 (56)	36.0 (54)	0.057	0.811	41.0 (41)	35.0 (35)	34.0 (34)	1.234	0.539
Wood for carvings	35.3 (53)	30.7 (46)	0.739	0.390	27.0 (27)	36.0 (36)	36.0 (36)	5.442	0.295
Reeds for mats	39.3 (59)	40.7 (61)	0.056	0.814	39.0 (39)	44.0 (44)	37.0 (37)	1.083	0.582
Thatching grass	35.3 (53)	36.7 (55)	0.058	0.810	40.0 (40)	36.0 (36)	32.0 (32)	1.389	0.499
Grazing land	34.0 (51)	36.0 (54)	0.132	0.717	39.0 (39)	33.0 (33)	33.0 (33)	1.055	0.590
Cultivation land	46.0 (69)	46.0 (69)	0.001	1.000	44.0 (44)	47.0 (47)	47.0 (47)	0.242	0.886

Note: Significant p-values are in italics ($p < 0.05$)

Table 2: Proportion of respondents (%) perceptions indicating sufficient availability of resources disaggregated by household size and household socio-economic status class (frequency in brackets)

	Households size					Households SES classes				
Resources	Small (n=179)	Medium (n=103)	Large (n=18)	χ^2	p-value	Poor (n=245)	Middle (n=47)	Wealthy (n=8)	χ^2	p-value
Edible wild herbs	69.3 (124)	68.9 (71)	72.2 (13)	0.079	0.961	69.0 (169)	72.3 (34)	62.5 (5)	0.390	0.390
Wild fruits	57.5 (103)	65.0 (67)	61.1 (11)	1.544	0.462	60.8 (149)	57.4 (27)	62.5 (5)	0.203	0.903
Edible insects	62.6 (112)	63.1 (65)	61.1 (11)	0.028	0.986	64.5 (158)	57.4 (27)	37.5 (3)	3.061	0.216
Bushmeat	23.5 (42)	31.1 (32)	55.6 (10)	9.088	*0.011*	27.8 (68)	25.5 (12)	50.0 (4)	2.070	0.355
Fuelwood	23.5 (42)	22.3 (23)	33.3 (6)	1.037	0.595	23.7 (58)	19.1 (9)	50.0 (4)	3.602	0.165
Traditional medicine	67.6 (121)	68.0 (70)	55.6 (10)	1.138	0.566	69.4 (170)	55.3 (26)	62.5 (5)	3.605	0.165
Grass and twigs	34.6 (62)	37.9 (39)	38.9 (7)	0.365	0.833	37.1 (91)	29.8 (14)	37.5 (3)	0.934	0.627
Building poles	27.4 (49)	27.2 (28)	27.8 (5)	0.242	0.886	31.0 (76)	12.8 (6)	37.5 (3)	6.812	*0.033*
Fence poles	35.2 (63)	38.8 (40)	38.9 (7)	0.414	0.813	38.0 (93)	31.9 (15)	25.0 (2)	1.102	0.576
Wood for carvings	31.8 (57)	35.9 (37)	27.8 (5)	0.728	0.695	35.9 (88)	21.3 (10)	12.5 (1)	5.386	0.190
Reeds for mats	36.9 (66)	44.7 (46)	44.4 (8)	1.810	0.405	39.1 (96)	42.6 (20)	50.0 (4)	0.529	0.768
Thatching grass	34.1 (61)	38.8 (40)	38.9 (7)	0.711	0.701	35.9 (88)	34.0 (16)	50.0 (4)	0.759	0.684
Grazing land	39.7 (71)	29.1 (30)	22.2 (4)	4.566	0.102	37.1 (91)	27.7 (13)	12.5 (1)	3.388	0.184
Cultivation land	52.0 (93)	37.9 (39)	33.3 (6)	1.463	0.381	49.8 (122)	31.9 (15)	12.5 (1)	3.789	0.175

Note: Significant p-values are in italics ($p < 0.05$)

Table 3: Proportion of respondents (%) perceptions indicating sufficient availability of resources disaggregated by village (frequency in brackets)

	Villages						
Resources	Dumphries (n=60)	Hlalakahle (n=60)	Mapaleng (n=60)	Seville (n=60)	Zoeknog (n=60)	χ^2	p-value
Edible wild herbs	80.0 (48)	85.0 (51)	98.3 (59)	43.3 (26)	40.0 (24)	77.226	*0.001*
Wild fruits	65.0 (39)	66.7 (40)	98.3 (59)	31.7 (19)	40.0 (24)	68.722	*0.001*
Edible insects	51.7 (31)	58.3 (35)	93.3 (56)	48.3 (29)	61.7 (37)	32.998	*0.001*
Bushmeat	38.3 (23)	0.0 (0)	85.0 (51)	1.7 (1)	15.0 (9)	1.489	*0.001*
Fuelwood	20.0 (12)	1.7 (1)	36.7 (22)	3.3 (2)	56.7 (34)	72.034	*0.001*
Traditional medicine	53.3 (32)	71.7 (43)	95.0 (57)	45.0 (27)	70.0 (42)	40.314	*0.001*
Grass and twigs	31.7 (19)	6.7 (4)	95.0 (57)	25.0 (15)	21.7 (13)	1.220	*0.001*
Building poles	11.7 (7)	5.0 (3)	81.7 (49)	6.7 (4)	36.7 (22)	1.243	*0.001*
Fence poles	21.7 (13)	15.0 (9)	91.7 (55)	15.0 (9)	40.0 (24)	1.085	*0.001*
Wood for carvings	10.0 (6)	11.7 (7)	96.7 (58)	10.0 (6)	36.7 (22)	1.514	*0.001*
Reeds for mats	45.0 (27)	3.3 (2)	96.7 (58)	25.0 (15)	30.0 (18)	1.226	*0.001*
Thatching grass	38.3 (23)	3.3 (2)	93.3 (56)	20.0 (12)	25.0 (15)	1.234	*0.001*
Grazing land	20.0 (12)	60.0 (36)	1.7 (1)	61.7 (37)	31.7 (19)	70.769	*0.001*
Cultivation land	18.3 (11)	83.3 (50)	1.7 (1)	86.7 (52)	40.0 (24)	1.404	*0.001*

Note: Significant p-values are in italics ($p < 0.05$)

When analyzing the simultaneous effect of all of the specified determinants of perceptions of resource availability for consumable resources (Table 4), individual-level characteristics were found to have no significant effect, except in the case of grass and twigs for brooms. For these resources, males were much more likely to perceive sufficient availability of grass and twigs than females. The youth were less likely to perceive sufficient availability of grass and twigs compared to the elderly. At the household-level, household size had no significant influence, except in the case of bushmeat. Respondents from small and medium size households were substantially less likely to perceive sufficient availability of bushmeat, compared to those from large households. Household socio-economic status (SES) had no significant influence on perceptions of local availability of resources. At the village-level, there was substantial variation in perceptions of availability, differing by resource. For example, residents of Hlalakahle and Mapaleng villages were much more likely to perceive adequate local availability of edible wild herbs than those of Zoeknog village. Conversely, residents of Hlalakahle and Seville village were much less likely to perceive sufficient availability of fuelwood than those of Zoeknog village.

Similarly, when analyzing the simultaneous effect of all of the specified determinants of perception of resource availability for non-consumable resources (Table 5), individual-level characteristics were found to have no significant effect, except in the case of wood for carvings. For this resource, youth were less likely to perceive adequate supply of wood for carvings compared to the elderly. At the household-level, household SES class had no significant influence, except in the case of building poles. Respondents from poor and middle SES class households were substantially less likely to perceive sufficient local availability of building poles, compared to those from wealthy SES class households. Household size had no significant effect on perceptions of local availability of the resources. At the village-level, there was substantial variation in perceptions of availability, differing by resource. For instance, with exception of grazing and cultivating land, residents of Mapaleng village were much more likely to perceive adequate supply of resources than those of Zoeknog village. Conversely, residents of Hlalakahle and Seville village were much more likely to perceive sufficient availability of grazing land and cultivating land than those of Zoeknog village, while those of Dumphries village were less likely to perceive adequate supply.

Table 4: Multinomial logistic regression results for respondents perceptions indicating sufficient availability of consumable resources. All coefficients are in comparison to a reference category[a-e]

	Consumable Resources						
Variable	Edible wild herbs	Wild fruits	Edible insects	Bushmeat	Fuelwood	Traditional medicine	Grass and twigs
Intercept	-1.795	-0.597	-0.153	1.392	2.157	1.107	1.545
Gender[a]							
Male	0.489	-0.261	0.036	0.082	-0.421	-0.158	0.727**
Age group[b]							
Youth	-0.381	0.124	-0.122	0.139	0.138	0.530	1.003**
Middle aged	0.052	0.007	-0.222	0.535	0.250	0.438	0.810*
Household size[c]							
Small	-0.259	-0.260	-0.734	-2.582**	0.022	0.555	-0.368
Medium	-0.562	-0.031	-0.801	-2.492**	-0.198	0.553	-0.062
Household SES[d]							
Poor	1.613	0.494	1.487	-1.926	-1.770	1.019	-1.051
Middle	1.292	-0.019	1.201	-0.848	-1.591	-1.251	-1.268
Village[e]							
Dumphries	2.192***	1.210***	-0.227	1.449***	-2.037***	-0.705***	0.534
Hlalakahle	2.189***	1.137***	-0.132	-21.717	-4.393***	0.092	-1.416**
Mapaleng	4.604***	4.499***	2.176***	3.604***	-0.803**	2.158**	4.576***
Seville	0.146	0.353	-0.553	-2.659**	-3.676***	-1.037***	0.215
Models χ^2 values	93.667	85.857	42.043	176.295	86.528	51.746	147.098
Models p-values	0.001	0.021	0.001	0.001	0.001	0.047	0.001

*Denotes significance at $p < 0.1$; ** at $p < 0.05$ and *** at $p < 0.01$

[a] Reference category-Female

[b] Reference category- Elderly

[c] Reference category- Large households

[d] Reference category- Wealthy households

[e] Reference category- Zoeknog Village

Table 5: Multinomial logistic regression results for respondents perceptions indicating sufficient availability of non-consumable resources. All coefficients are in comparison to a reference category[a-e]

	Non-consumable resources						
Variable	Building poles	Fence poles	Wood for Carvings	Reeds	Thatch	Grazing land	Cultivation land
Intercept	1.050	-0.101	-0.625	-0.778	-0.734	-1.388	-1.000
Gender[a]							
Male	-0.218	0.087	0.467	-0.078	-0.081	-0.121	0.021
Age groups[b]							
Youth	0.041	-0.506	-1.037**	0.169	0.639	0.294	-0.347
Middle aged	0.345	-0.082	0.080	0.554	0.401	0.027	0.104
Household size[c]							
Small	-0.596	0.509	0.328	-0.762	-0.958	0.124	0.750
Medium	-0.390	0.654	0.608	0.553	-0.630	0.061	0.993
Household SES[d]							
Poor	-2.067*	0.009	0.641	-0.986	-1.543	0.523	1.602
Middle	-3.144*	0.059	0.196	-0.802	-1.522	0.418	0.997
Villages[e]							
Dumphries	-1.622**	-0.983**	-1.445**	0.600	0.586	-0.500	-0.822*
Hlalakahle	-2.422**	-1.351***	-1.528***	-2.552***	-2.305***	1.182***	2.052***
Mapaleng	2.233***	2.839***	4.160***	4.312***	3.915***	-3.287***	-3.671***
Seville	-2.056**	-1.363***	-1.741***	-0.236	-0.261	1.267***	2.334***
Models χ^2 values	135.804	117.951	172.111	148.422	143.051	84.974	168.069
Models p-values	0.001	0.001	0.001	0.003	0.001	0.001	0.001

*Denotes significance at $p < 0.1$; ** at $p < 0.05$ and *** at $p < 0.01$

[a] Reference category-Female

[b] Reference category- Elderly

[c] Reference category- Large households

[d] Reference category- Wealthy households

[e] Reference category- Zoeknog Village

4.4.2 *Resource governance and management*

The respondents were asked to state their perceptions of who controls access to the natural resources, for instance, if it was the chief, community, community development forum (CDF), government (e.g. nature conservation authority) or nobody controls access to the natural resources. As shown in Table 6, individual-level characteristics were found to have no significant effect on perceptions of who control access to the natural resources, except in the case of the chief and government. For these regulators, a significantly greater proportion of elderly respondents perceived the chief controls access to the natural resources compared to youth and middle aged ($\chi^2 = 2.850$; $p < 0.05$). On the contrary, a greater proportion of youth perceive the government controls access to the resources than the middle aged and elderly ($\chi^2 = 4.791$; $p < 0.05$). As shown in table 7, household-level characteristics had no significant influence on individual's perceptions of who controls access to the natural resources. Village resided in had a significant influence in determining individual's perceptions of who controls access to the natural resources, with the exception on nobody controls (Table 8). Seville and Mapaleng village had a significant greater proportions of respondents who perceived the chief controls access to the natural resources compared to other villages ($\chi^2 = 47.866$; $p < 0.05$). Hlalakahle village compared to other villages had significantly greater proportions of respondents who perceived that community development forum (CDF) ($\chi^2 = 16.117$; $p < 0.05$) and government ($\chi^2 = 40.726$; $p < 0.05$) controls access to the natural resources.

Table 6: Proportion of respondents (%) perceptions indicating who controls access to the natural resources disaggregated by gender and age group (frequency in brackets)

	Gender				Age groups				
Controller	Male (n=150)	Female (n=150)	χ^2	p-value	Youth (n=100)	Middle (n=100)	Elderly (n=100)	χ^2	p-value
Nobody	4.7 (7)	2.0 (3)	1.655	0.198	2.0 (2)	3.0 (3)	5.0 (5)	1.448	0.485
Chief	80.0 (120)	83.3 (125)	0.557	0.456	79.0 (79)	78.0 (78)	88.0 (88)	2.850	*0.049*
CDF	10.0 (15)	8.0 (12)	0.366	0.545	12.0 (12)	5.0 (5)	10.0 (10)	3.175	0.204
Government	38.7 (58)	40.7 (61)	0.125	0.723	45.0 (45)	43.0 (43)	31.0 (31)	4.791	*0.031*
Community	1.3 (2)	1.3 (2)	0.001	1.000	0.0 (0)	2.0 (2)	2.0 (2)	2.027	0.363

Note: Significant p-values are in italics ($p < 0.05$)

Table 7: Proportion of respondents (%) perceptions indicating who controls access to the natural resources disaggregated by household size and household socio-economic status class (frequency in brackets)

	Households size					Households SES classes				
Controller	Small (n=179)	Medium (n=103)	Large (n=18)	χ^2	p-value	Poor (n=245)	Middle (n=47)	Wealthy (n=8)	χ^2	p-value
Nobody	2.2 (4)	4.9 (5)	5.6 (1)	1.686	0.430	2.0 (5)	10.6 (5)	0.0 (0)	3.330	0.970
Chief	83.2 (149)	80.6 (83)	72.2 (13)	1.449	0.485	83.7 (205)	72.3 (34)	75.0 (6)	3.627	0.163
CDF	8.4 (15)	8.9 (9)	16.7 (3)	1.385	0.500	7.3 (18)	14.9 (7)	25.0 (2)	3.302	0.701
Government	41.3 (74)	38.8 (40)	27.8 (5)	1.302	0.521	41.6 (102)	34.0 (16)	12.5 (1)	3.484	0.175
Community	1.1 (2)	1.9 (2)	0.0 (0)	0.597	0.597	1.2 (3)	2.1 (1)	0.0 (0)	2.356	0.837

Table 8: Proportion of respondents (%) perceptions indicating who controls access to the natural resources disaggregated by village (frequency in brackets)

	Villages						
Controller	Dumphries (n=60)	Hlalakahle (n=60)	Mapaleng (n=60)	Seville (n=60)	Zoeknog (n=60)	χ^2	p-value
Nobody	0.0 (0)	8.3 (5)	3.3 (2)	0.0 (0)	5.0 (3)	2.310	0.540
Chief	68.3 (41)	90.0 (54)	95.0 (57)	96.7 (58)	58.3 (35)	47.866	*0.001*
CDF	13.3 (8)	18.3 (11)	0.0 (0)	10.0 (6)	3.3 (2)	16.117	*0.003*
Government	38.3 (23)	60.0 (36)	33.3 (20)	10.0 (6)	56.7 (34)	40.726	*0.001*
Community	6.7 (4)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	5.216	0.250

Note: Significant p-values are in italics ($p < 0.05$)

When analyzing the simultaneous effect of all of the specified determinants of perceptions of resource governance and management with regards to who controls access to the natural resources (Table 9), individual-level characteristics were found to have no significant effect, except in the case that the chief and government controls access to the natural resources. For these regulators, youth and middle aged were less likely to perceive that the chief controls access to the natural resources than elderly. On the contrary, youth were much more likely to perceive that the government controls access to the resources than elderly. Household-level characteristics, were found to have no significant influence on perceptions of who controls access to the natural resources. At the village-level, there were variations in perceptions of who controls access to the natural resources, differing by controllers. For example, residents from all four villages were much more likely to perceive that the chief controls access to the resources than those from Zoeknog village. Residents of Hlalakahle village were more likely to perceive that a community development forum (CDF) controls access to the natural resources than those of Zoeknog village. On the other hand, residents of Mapaleng and Seville village were less likely to perceive that the government controls access to the natural resources than those of Zoeknog village.

Table 9: Multinomial logistic regression results for respondent perceptions of who controls access to the natural resources. All coefficients are in comparison to a reference category[a-e]

Variable	Nobody	Chief	CDF	Government	Community
Intercept	-2.673	0.613	-2.062	-1.477	-55.795
Gender[a]					
Male	0.360	-0.254	0.284	-0.113	-0.153
Age groups[b]					
Youth	-0.190	-0.872*	0.485	0.611*	-18.028
Middle aged	0.122	-0.773*	-0.617	0.521	-0.828
Household size[c]					
Small	-0.496	0.838	-0.290	-0.449	16.123
Medium	0.301	0.551	-0.197	-0.311	16.427
Household SES[d]					
Poor	-0.684	-0.285	-1.330	1.850	18.835
Middle	1.781	-0.846	-0.572	1.545	17.148
Villages[e]					
Dumphries	-17.776	0.746*	1.005	-0.549	20.00
Hlalakahle	0.354	1.931***	1.890**	1.155	0.098
Mapaleng	-1.029	2.772***	-20.055	-1.003***	0.120
Seville	-17.085	3.204***	1.151	-2.505***	0.111
Models χ^2 values	25.879	56.988	27.987	53.346	20.811
Models p-values	0.007	0.001	0.003	0.001	0.035

*Denotes significance at $p < 0.1$; ** at $p < 0.05$ and *** at $p < 0.01$

[a] Reference category-Female

[b] Reference category- Elderly

[c] Reference category- Large households

[d] Reference category- Wealthy households

[e] Reference category- Zoeknog Village

In addition, the respondents were also asked to state their perceptions of the necessity of getting permits to harvest natural resources (bushmeat, traditional medicine, wet fuelwood, fence poles, building poles, wood for carvings and wood for furniture) and that permits were issued by either the chief or nature conservation authorities. At the individual-level, there was a significant influence of gender in determining individuals' perceptions of the necessity of getting permits to harvest wet fuelwood, fence poles and wood for furniture (Table 10). Although few respondents thought that it was necessary to get permits to harvest the natural resources, significantly greater proportions of females than males consistently perceived that it was necessary to get harvesting permits. Gender also showed a significant influence on perceptions that the chief was the main issuer of harvesting permits, as a significantly greater proportion of females than males perceived that the chief was the person who issues the permits to harvest resources. Age had a significant influence in determining individuals' perceptions that it was necessary to get permits to harvest fence poles and wood for carvings (Table 10). A significantly greater proportion of elderly than young and middle aged individuals perceived that it was necessary to get permits to harvest fence poles and wood for carvings. Age also showed a significant influence on perceptions that the chief was the person who issue the permits to harvest resources, as a significant greater proportion of elderly than young and middle aged individuals perceived that the chief was the person who issues the harvesting permits. As Table 11 demonstrates, household-level characteristics were found to have no significant effect on individual perceptions of the necessity of getting harvesting permits and that permits were issued by either the chief or nature conservation authorities. At village-level, there were considerable variations in perceptions of resource governance and management, differing by resources and permits issuers (Table 12). For instance, over 90% of residents from Mapaleng village perceived that it was necessary to get permits to harvest traditional medicine and wood for carvings than those from other villages, whereas less than 50% of respondents in all the villages perceived it was necessary to get permits to harvest other natural resources. Hlalakahle village had significantly greater proportions of respondents who perceived the chief and nature conservation authorities were permit issuers to harvest the natural resources than other villages.

Table 10: Proportion of respondents (%) perceptions indicating that it was necessary to get permits to harvest natural resources and that permits were issued by either the chief or nature conservation authorities disaggregated by gender and age group (frequency in brackets)

	Gender				Age groups				
Resource	Male (n=150)	Female (n=150)	χ^2	p-value	Youth (n=100)	Middle (n=100)	Elderly (n=100)	χ^2	p-value
Bushmeat	16.0 (24)	14.7 (22)	0.103	0.749	19.0 (19)	15.0 (15)	12.0 (12)	1.900	0.387
Traditional medicine	67.3 (101)	69.3 (104)	0.139	0.710	70.0 (70)	73.0 (73)	62.0 (62)	2.988	0.224
Wet fuelwood	5.3 (8)	11.3 (17)	6.673	*0.015*	9.0 (9)	11.0 (11)	5.0 (5)	2.444	0.294
Fence poles	20.7 (31)	32.0 (48)	4.966	*0.026*	22.0 (22)	23.0 (23)	34.0 (34)	4.571	*0.022*
Building poles	24.7 (37)	26.7 (40)	0.157	0.692	21.0 (21)	27.0 (27)	29.0 (29)	1.817	0.403
Wood for carvings	40.0 (60)	38.7 (58)	0.056	0.813	38.0 (38)	36.0 (36)	44.0 (44)	2.453	*0.050*
Wood for furniture	10.0 (15)	17.3 (26)	4.027	*0.035*	12.0 (12)	12.0 (12)	17.0 (17)	1.413	0.493
Permits issuers									
Chief	79.3 (119)	87.3 (131)	3.456	*0.016*	81.0 (81)	79.0 (79)	90.0 (90)	4.944	*0.040*
Nature conservation authorities	41.3 (62)	36.0 (54)	0.900	0.343	41 (41)	35.0 (35)	40.0 (40)	0.871	0.647

Note: Significant p-values are in italics ($p < 0.05$).

Table 11: Proportion of respondents (%) perceptions indicating that it was necessary to get permits to harvest natural resources and that permits were issued by either the chief or nature conservation authorities disaggregated by household size and household socio-economic status class (frequency in brackets)

	Households size					Households SES classes				
Resource	Small (n=179)	Medium (n=103)	Large (n=18)	χ^2	p-value	Poor (n=245)	Middle (n=47)	Wealthy (n=8)	χ^2	p-value
Bushmeat	15.1 (27)	14.6 (15)	22.2 (4)	0.714	0.700	13.1 (32)	25.5 (12)	25.0 (2)	5.316	0.183
Traditional medicine	65.4 (117)	73.8 (76)	66.7 (12)	2.168	0.338	68.2 (167)	70.2 (33)	62.5 (5)	0.206	0.902
Wet fuelwood	9.5 (17)	6.8 (7)	5.6 (1)	0.818	0.664	7.8 (19)	10.6 (5)	12.5 (1)	0.616	0.735
Fence poles	24.0 (43)	30.1 (31)	27.8 (5)	1.264	0.531	25.3 (62)	29.8 (14)	37.5 (3)	0.937	0.626
Building poles	25.7 (46)	27.2 (28)	16.7 (3)	0.889	0.641	26.5 (65)	23.4 (11)	12.5 (1)	0.937	0.622
Wood for carvings	41.9 (75)	37.9 (39)	22.2 (4)	2.796	0.247	42.4 (104)	27.7 (13)	12.5 (1)	5.095	0.213
Wood for furniture	16.8 (30)	9.7 (10)	5.6 (1)	3.823	0.148	14.3 (35)	12.8 (6)	0.0 (0)	1.378	0.350
Permits issuers										
Chief	86.0 (154)	78.6 (81)	83.3 (15)	2.573	0.276	84.1 (206)	80.9 (38)	75.0 (6)	0.707	0.702
Nature conservation authorities	39.1 (70)	39.8 (41)	27.8 (5)	0.971	0.615	41.2 (101)	27.7 (13)	25.0 (2)	3.707	0.157

Table 12: Proportion of respondents (%) perceptions indicating that it was necessary to get permits to harvest natural resources and that permits were issued by either the chief or nature conservation authorities disaggregated by village (frequency in brackets)

	Villages						
Resource	Dumphries (n=60)	Hlalakahle (n=60)	Mapaleng (n=60)	Seville (n=60)	Zoeknog (n=60)	χ^2	p-value
Bushmeat	40.0 (24)	1.7 (1)	3.3 (2)	1.7 (1)	30.0 (18)	61.982	*0.001*
Traditional medicine	61.7 (37)	85.0 (51)	95.0 (57)	18.3 (11)	81.7 (49)	1.029	*0.001*
Wet fuelwood	15.0 (9)	3.3 (2)	3.3 (2)	1.7 (1)	18.3 (11)	18.764	*0.001*
Fence poles	30.0 (18)	23.3 (14)	26.7 (16)	6.7 (4)	45.0 (27)	23.438	*0.001*
Building poles	20.0 (12)	26.7 (16)	26.7 (16)	8.3 (5)	46.7 (28)	24.390	*0.001*
Wood for carvings	13.3 (8)	35.0 (21)	95.0 (57)	5.0 (3)	48.3 (29)	1.271	*0.001*
Wood for furniture	8.3 (5)	8.3 (5)	0.0 (0)	3.3 (2)	48.3 (29)	78.934	*0.001*
Permits issuers							
Chief	83.3 (50)	95.0 (57)	81.7 49	93.3 (56)	63.3 (38)	27.600	*0.001*
Nature conservation authorities	21.7 (13)	68.3 (41)	43.3 26	6.7 (4)	53.3 (32)	61.479	*0.001*

Note: Significant p-values are in italics ($p < 0.05$)

When analyzing the simultaneous effect of all of the specified determinants of perception of resource governance and management regarding the necessity of getting permits to harvest natural resources from the bush and that permits were issued by either the chief or nature conservation authorities (Table 13), individual-level characteristics were found to have a significant influence, except in the case of bushmeat and building poles. For instance, males were much less likely than females to perceive it was necessary to get permits to harvest wet fuelwood, fence poles and wood for furniture. Further, males were also much less likely than females to perceive that the chief was the person who issue permits to harvest the natural resources. The youth and middle aged were more likely to perceive it was necessary to get permits to harvest traditional medicine and wet fuelwood than elderly. On the contrary, the youth and middle aged respondents were less likely to perceive it was necessary to get permits to harvest fence poles and wood for carvings than elderly. Further, youth and middle aged respondents compared to elderly were less likely to perceive they get permits from the chief to harvest natural resources. Household-level characteristics had no significant effect on individual's perceptions of resource governance and management. At the village-level, there was substantial variation in perceptions of resource governance and management, differing by resource and permits issuers (Table 13). For example, residents in all the villages compared to those in Zoeknog village were less likely to perceive it was necessary to get permits to harvest fence and building poles. Conversely, residents of these villages Hlalakahle, Mapaleng and Seville were less likely to perceive it was necessary to get permits to harvest bushmeat and wet fuelwood than those of Zoeknog village. In addition, residents in all the villages compared to those in Zoeknog village were much more likely to perceive that the chief was the person who issues the permits to harvest the natural resources. On the other hand, residents of Dumphries and Seville village were less likely to perceive that the nature conservation authorities were the people who issue the permits to harvest natural resources than those of Zoeknog village.

Table 13: Multinomial logistic regression results for perceptions of resource governance and management. All coefficients are in comparison to a reference category[a-e]

	Resources							Permits issuers	
Variable	Bushmeat	Traditional medicine	Wet fuelwood	Fence poles	Building poles	Wood for carvings	Wood for furniture	Chief	Nature conservation authorities
Intercept	-1.585	1.702	-2.029	0.615	-0.757	-0.335	-17.240	0.253	0.213
Gender[a]									
Male	0.104	-0.125	-0.891*	-0.662**	-0.120	0.168	-0.877**	-0.762**	0.304
Age groups[b]									
Youth	0.658	0.741**	0.698*	-0.609*	-0.504	-0.575*	-0.679	-1.247**	0.062
Middle aged	0.302	0.876**	1.067*	-0.582*	-0.134	-0.658*	-0.616	-1.275**	-0.290
Household size[c]									
Small	-0.199	-0.500	1.865	-0.074	0.158	1.397	0.176	-0.549	-0.303
Medium	-0.344	0.024	1.291	0.180	0.243	0.663	-0.379	-1.207	-0.005
Household SES[d]									
Poor	0.567	-0.317	-1.478	-0.106	0.717	-0.557	17.999	2.380	0.084
Middle	0.869	0.087	-0.869	-0.001	0.657	-0.673	18.477	1.683	-0.335
Villages[e]									
Dumphries	0.405	-1.341***	-0.295	-0.767*	-1.147**	-1.655***	-2.341***	1.660***	-1.366***
Hlalakahle	-3.266***	0.251	-1.958**	-1.029**	-0.883**	-0.595	-2.505***	2.562***	0.668*
Mapaleng	-2.542***	1.354**	-1.798**	-0.904**	-0.893**	3.293***	-20.032	1.127**	-0.443
Seville	-3.274***	-3.183***	-2.631**	-2.534**	-2.275***	-2.939***	-3.471***	2.323***	-2.804***
Models χ^2 values	68.577	114.902	27.976	37.082	28.171	154.842	80.432	44.434	72.164
Models p-values	0.001	0.001	0.003	0.001	0.003	0.001	0.001	0.001	0.001

*Denotes significance at $p < 0.1$; ** at $p < 0.05$ and *** at $p < 0.01$

[a] Reference category-Female

[b] Reference category- Elderly

[c] Reference category- Large households

[d] Reference category- Wealthy households

[e] Reference category- Zoeknog Village

4.5 The influence of household resource use on environmental perceptions

4.5.1 *Resource availability*

4.5.1.1 *Consumable resources*

The consumable resources were edible wild herbs, wild fruits, edible insects, bushmeat, fuelwood, and tradition medicine. Apart from fuelwood and traditional medicine, there was a significant relationship between household resource use pattern and perceptions of resource availability (Table 14). For edible wild herbs, wild fruits and edible insects, households that used the resource regularly were less likely to consider availability of the resource to be sufficient. The pattern is little different for the other three resources (Table 14). For instance, households which consumed bushmeat 1-3 times/week had a greater proportion of respondents who perceived availability of bushmeat to be sufficient.

When assessing the effect of one variable (frequency of resource use) by comparing the effect of different frequencies of use categories relative to daily use (Table 15), all the frequencies of resource use were found to have a significant effect on perceptions of resource availability, except in the case of fuelwood and traditional medicine. The households which never consume edible insects were more likely to perceive sufficient availability than those which consume every day. Conversely, households which consumed edible wild herbs, wild fruits and edible insects 4-6 times/week were much more likely to perceive sufficient availability than those households which consumed them every day. In addition, households which consumed wild fruits 1-3 times/week were more likely to perceive adequate supply, compared to those households which consumed them every day. Households which consumed wild fruits and edible insects less often were more likely to perceive adequate supply than those which consumed them every day. Interestingly, no household consumed bushmeat every day, but households which never consumed bushmeat, consumed it less often or consumed it 1-3 times/week were all less likely to perceive adequate supply of bushmeat, compared to those households which consume it 4-6 times/week.

Table 14: Proportion of respondents (%) indicating sufficient availability of consumable resources and frequency of resource use (frequency in brackets) (N =300)

	Frequency of resource use						
Consumable resource availability	Every day	4-6 times/week	1-3 times/week	Less often	Never	χ^2	p-value
Edible wild herbs	*n* = 34	*n* = 84	*n* = 157	*n* = 20	*n* = 5		
sufficient	61.8 (21)	84.5 (71)	61.8 (97)	75.0 (15)	80.0 (4)	14.811	*0.005*
Wild Fruits	*n* = 21	*n* = 16	*n* = 101	*n* = 98	*n* = 64		
sufficient	33.3 (7)	62.5 (10)	63.4 (64)	69.4 (68)	50.0 (32)	13.029	*0.011*
Edible insects	*n* = 11	*n* = 12	*n* = 113	*n* = 81	*n* = 83		
sufficient	27.2 (3)	66.7 (8)	50.4 (57)	77.8 (63)	68.7 (57)	22.376	*0.001*
Bushmeat	*n* = 0	*n* = 5	*n* = 12	*n* = 88	*n* = 195		
sufficient	0.0 (0)	20.0 (1)	83.3 (10)	40.9 (36)	19.0 (37)	33.537	*0.001*
Fuelwood	*n* = 128	*n* = 80	*n* = 60	*n* = 28	*n* = 4		
sufficient	23.4 (30)	26.2 (21)	16.7 (10)	28.6 (8)	50.0 (2)	3.835	0.429
Traditional medicine	*n* = 9	*n* = 8	*n* = 28	*n* = 144	*n* = 111		
sufficient	55.6 (5)	87.5 (7)	46.4 (13)	69.4 (100)	68.5 (76)	7.910	0.195

Note: Significant p-values are in italics ($p < 0.05$) and *n* means total number of respondents at each frequency of resource use

Table 15: Multinomial logistic regression results for influence of household resource use frequency on perception of resource availability

	Consumable Resources					
Variable	Edible wild herbs	Wild fruits	Edible insects	Bushmeat	Fuelwood	Traditional medicine
Intercept	0.480	-0.693	-0.981	1.609	-1.184	0.223
Frequency of use[a]						
Never	0.907	0.693	1.766**	-3.061***	1.184	0.552
Less often	0.619	1.511**	2.234***	-1.977**	0.267	0.598
1-3 times/week	0.001	1.241**	0.999	-2.996**	-0.426	-0.366
4-6 times/week	1.218***	1.204**	1.674*	-	-0.426	-0.366
Models χ^2 values	15.879	12.918	22.603	31.404	3.709	7.807
Models p-values	0.003	0.012	0.001	0.001	0.049	0.099

*Denotes significance at $p < 0.1$; ** at $p < 0.05$ and *** at $p < 0.01$

[a] Reference category- Every day

Note: Reference category for frequency of use for bushmeat was 4-6 times/week because no households used bushmeat every day.

4.5.1.2 Non-consumable natural products

The non-consumable natural products used or owned by households were wooden carvings, reed mats, grass and twigs brooms, fence poles, building poles and thatched roofs. The relationship between household resource use and perceptions of resource availability was significant, except in the case of reed mats (Table 16). Significantly smaller proportions of respondents who used or owned a particular non-consumable natural product perceived sufficient supply of that particular non-consumable resource. For instance, only 34.7% of 277 respondents who owned wooden carvings perceived sufficient supply of wood for carvings compared to 87% of 23 respondents who did not own any (Table 16). The pattern was the same for the other non-consumable natural products and this clearly showed that most households which used or owned non-consumable natural products were less likely to perceive the local availability of non-consumable resources to be sufficient.

Table 16: Proportion of respondents (%) perceptions who owned or not owned non-consumable natural products indicating sufficient resource availability (frequency in brackets) (N=300).

Non-consumable natural products				
Non-consumable resource availability	Ownership		χ^2	p-value
Wood for carvings *sufficient*	*Owned (n=277)* 34.7 (96)	*Not owned (n=23)* 87.0 (20)	4.487	*0.034*
Reeds for mats *sufficient*	*Owned (n=286)* 40.2 (115)	*Not owned (n=14)* 64.3 (9)	0.112	0.737
Grass and twigs for brooms *sufficient*	*Owned (n=293)* 36.9 (108)	*Not owned (n=7)* 71.4 (5)	4.032	*0.045*
Fence poles *sufficient*	*Used (n=197)* 22.3 (44)	*Not used (n=103)* 64.1 (66)	50.750	*0.001*
Building poles *sufficient*	*Used (n=137)* 16.1 (22)	*Not used (n=163)* 61.3 (100)	18.710	*0.001*
Thatch for roofs *sufficient*	*Owned (n=121)* 27.3 (33)	*Not owned (n=179)* 58.1 (104)	6.704	*0.010*

Note: Significant p-values are in italics ($p < 0.05$) and *n* means total number of respondents at each category (owned and not owned a non-consumable natural product).

Bivariate analyses on effect of household resource use on perception of resource availability, household resource used or owned were found to have a significant relationship with respondents' perceptions of local availability of a resource, except in the case of reed mats and reeds availability (Table 17). Those respondents from households which did not use or own a particular non-consumable natural product were much more likely to perceive sufficient supply of a particular non-consumable resource compared to those who used or owned a particular non-consumable natural product in their households.

Table 17: Bivariate analyses results for influence of household resource use on perceptions of sufficient availability of non-consumable resources. All coefficients are in comparison to a reference category[a]

	Sufficient availability of non-consumable resources
Models statistics	*Wood for carvings*
Intercept	0.634
Wooden carvings not owned [a]	1.263**
Model χ^2 value	5.200
Model p-value	0.023
	Reeds for mats
Intercept	0.397
Reed mats not owned	0.191
Model χ^2 value	0.114
Model p-value	0.736
	Grass and twigs for brooms
Intercept	0.538
Brooms not owned	20.778***
Model χ^2 value	6.342
Model p-value	0.012
	Wood for fences
Intercept	1.246
Fence poles not used	1.825***
Model χ^2 value	50.523
Model p-value	0.001
	Wood for building
Intercept	1.654
Building poles not used	1.192***
Model χ^2 value	19.416
Model p-value	0.001
	Thatch for roofs
Intercept	0.981
Thatched roof not owned	0.654**
Model χ^2 values	6.823
Model p-values	0.009

*Denotes significance at $p < 0.1$; ** at $p < 0.05$ and *** at $p < 0.01$

[a] Reference category- Non-consumable natural products used / owned by households.

4.5.2 *Resource governance and management*

As shown in Table 18, logistic regression analysis results showed that household resource use scores had no significant influence on perceptions of who controls access to the natural resources, except in the case of the community development forum (CDF) and the community itself (Table 18). The more resources a household used regularly, the more likely the respondent was to perceive that CDF ($\beta = 2.990$, $p < 0.05$) and community ($\beta = 7.892$, $p < 0.1$) control access to the natural resources. For every extra increase in household resource use, the odds of perceiving that CDF and the community controls access to the natural resources increased by a factor of 19.883 and 2.675, respectively.

Table 18: Binary logistic regression results for influence of household resource use on perceptions of resource governance and management with respect to who controls access to the natural resources

Variable		Nobody	Chief	CDF	Government	Community
Household resource use score [b]	Coefficient (β)	3.332	-1.658	2.990	-0.059	7.892
	Standard error	2.404	1.053	1.488	0.802	4.665
	p-value	0.166	0.110	0.045**	0.941	0.091*
	Exp (β)	28.006	0.190	19.883	0.942	2.675
	Constant	-5.343	2.443	-4.067	-0.386	-9.296
	Model χ^2	11.843	11.679	7.791	7.373	11.799
	Model p-value	0.158	0.255	0.454	0.497	0.160

*Denotes significance at $p < 0.1$;** at $p < 0.05$ and *** at $p < 0.01$

[b] Continuous variable with score ranging between 0 – 1 , with 0 representing no resources used by a household and 1 is using all resources daily.

CHAPTER 5

5.0 DISCUSSION

5.1 Resource use

Rural populations in regions across the developing world are heavily reliant on collection of local natural resources to sustain their basic daily needs (Shackleton *et al*., 2000; Twine *et al*., 2003b; Belcher *et al*., 2005). Previous studies have indicated that rural people in South Africa have depended heavily on natural resources use for their livelihood (Hansen, 1998; Dovie *et al*., 2002; Andrew *et al*., 2003; Twine *et al*., 2003b; Shackleton & Shackleton, 2004; Makhado *et al*., 2009). The prevalence of resource use found in this study supports these findings. Edible wild herbs and fuelwood were the most widely used resources, utilised by almost all households in Bushbuckridge. For edible wild herbs, the finding is in agreement with a number of studies in South Africa having reported on the use of wild edible herbs as important source of supplementary nutrition in rural South Africa (High & Shackleton, 2000; Nesamvuni *et al*., 2001; Dovie *et al*., 2007). The use of wild edible herbs is common throughout sub-Saharan Africa, where it is an important component of local diets in countries such as Kenya (Shumsky *et al*., 2014) ad Ethiopia (Addis *et al*., 2005). As for fuelwood, it is the dominant source of energy used in most rural communities to meet day-to-day domestic energy requirements. Previous studies in Zimbabwe, Kenya, Mozambique, Tanzania, South Africa and India, to name a few, has shown that the vast majority of rural households rely extensively upon fuelwood as their basic energy source and remains the most easily affordable energy source (Heltberg *et al.,* 2000; Sheya & Mushi, 2000; Vermeulen *et al*., 2000; Kituyi *et al*., 2001; Brouwer & Falcão, 2004; Matsika *et al*., 2012;). Most households in Bushbuckridge were connected to national grid electricity by 2002 (Madubansi & Shackleton, 2007). However, Madubansi and Shackleton (2007) showed that the mean per capita consumption of fuelwood did not change between 1991 and 2002 despite the electrification of all households in four out of five settlements studied and even with the policy of 6 kWh per month of free electricity. This is associated to several socio-economic factors such as the relatively high cost of electricity through monthly tariffs and the need to purchase and maintain the technologies such as stoves, pose a deterrent to financially strained rural households from fully transitioning (White et al., 1997; Williams & Shackleton, 2002). The continued use of fuelwood could also be attributed to the fact that it was obtained free and was believed to cook food faster than the other fuels.

Similar results were also obtained in Zimbabwe and Kenya where rural inhabitants preferred using wood for thermal applications because it was a free commodity and in cases where it was purchased it was relatively cheaper than other fuels (Marufa *et al*., 1996; Kituyi *et al*., 2001).

Regarding the frequency of use of consumable resources, fuelwood was consumed every day by a majority of households while edible wild herbs, wild fruits and edible insects were mostly consumed 1-3 times/week. In this study, it was clear that these resources are consumed in most households compared to traditional medicine and bushmeat which were consumed less than once a month. Previous studies have indicated that more than 80% of rural households in South Africa make use fuelwood, edible wild herbs, wild fruits and edible insects daily for domestic purposes than consumable resources such as traditional medicine and bushmeat which are used by fewer households (Twine *et al.*, 2003b; Dovie *et al.*, 2005; Shackleton & Shackleton, 2006). In this study, most respondents in their households used traditional medicine less often. The number of respondents using traditional medicine in their households may actually be higher than reported due to the failure of study participants to disclose their use because of beliefs people may have. For example, a number of respondents may belong to religious groups that forbid the use of traditional medicine because of its perceived association with witchcraft (Kalaba *et al.*, 2013). The imposition of religious sanctions on users of traditional medicines has also been reported in rural communities in the South African savanna (Shackleton *et al*., 2007). It can also be due to that pharmaceutical medicine are often within the reach to most households through the Western health facilities such as the village clinics. As for bushmeat, most households never consumed it in last 12 months in their households. This could possibly be because hunting may be limited to households possessing sufficient skills and tools. As the result, most households tend not to consume bushmeat. There may also be some under-reporting of bushmeat use, as people might be afraid of recrimination, because bushmeat is often hunted illegally in nearby conservation area. A study by Wilkie *et al*. (2000) in Congo basin, pointed out that standards of life such as the size and income of households have an important influence on the frequency of bushmeat consumption in urban households as people with substantial incomes regularly bought more bushmeat.

5.2 Dominant environmental perceptions

5.2.1 *Resource availability*

The local availability of natural resources is an important issue, mostly because it is a dimension of sustainability. In this study, the perceptions of resource availability differed by resource. Over half of the respondents perceived sufficient supply of edible wild herbs, traditional medicine, edible insects and wild fruits, while other resources were perceived to be sufficient by less than half of respondents. Edible wild herbs and fuelwood were dominantly perceived to be sufficient and insufficient, respectively, by most of the respondents. A study by Dovie *et al*. (2007) in Bushbuckridge found that, there was a decline in the availability of edible wild herbs, but confirmed sufficient supply. A commonly used resource such as indigenous edible wild herbs perceived to be in adequate supply can be attributed to different growth forms and life history strategies when compared to trees for fuelwood. The indigenous edible wild herbs are mostly fast growing annual or biennials and they are also generally ruderal species (e.g. *Amaranthus spp., Bidens spp., Cleome gynandra, Corchorus tridens, Momordica balsamina and Tribulus terrestris*) that grow in disturbed sites (although not restricted to them) such as fallow fields (Shackleton, 2003). Thus, edible wild herbs were perceived to be in sufficient supply despite regular use. Growth forms can also apply to edible insects which were also perceived to be sufficient. This could possibly be because most species of insects and herbs are small, abundant, and fast growing and short-lived, compared to larger animals such as mammals for bushmeat. Fast growing, short-lived species such as insects and herbs, are also likely to fluctuate in availability much more between years than other life forms due to rainfall. The wild fruits from trees were perceived to be sufficient. This is because fruit harvesting is non- destructive to the tree, and if the seeds are discarded, it does not necessarily impact negatively on reproduction. In additional, large fruiting trees are locally protected by traditional taboo (Twine, 2005). However, growth forms such as trees are slow growing and devote their first few years delaying reproduction in order to use resources to yield permanent woody structures which has implications for fruit availability if cutting of large trees increases in the future.

Although the harvesting of deadwood is permitted, all or most of the deadwood has already been harvested in the surrounding communal lands due to the high demand, pervasive cutting of live stems for fuelwood (Williams & Shackleton, 2002; Dovie *et al*., 2004). As a result, fuelwood was

dominantly perceived to be mostly inadequate supply resource than any other natural resource in this present study. This finding goes along with the finding of many studies. For instance, Kirkland *et al*. (2007) reported that 90% of respondents interviewed agreed that shortage of fuelwood was a problem around villages in Bushbuckridge. At the same line, Twine *et al*. (2003b) pointed out that over-harvesting of fuelwood has caused a decline in the availability of fuelwood around some villages and it has forced vendors to travel long distances to find other sources of fuelwood. In the face of this decline in availability of fuelwood, collectors may also resort to harvesting of less popular fuelwood species thus widening the range of collected species (Madubansi & Shackleton, 2007). Unlike other energy sources, fuelwood is not solely a marketed commodity. It does not carry a full production cost because it is often freely available. This might make it difficult for policy makers and planners to devise solutions to its growing scarcity. Further, Dovie *et al.* (2004) demonstrated the complexity of the fuelwood crisis in Bushbuckridge and linked it not only with the use of wood for fuel, but also with the use of the same type of wood for other purposes, such as construction poles and carvings. This may explain why less than half of respondents in this study perceived sufficient availability of wood for buildings, fences and carvings. This is why Andrew *et al*. (2003) pointed out that a considerable number of communities in rural South Africa are faced with increasing shortages of one or more of these natural resources required to meet their daily needs. In addition the decline of these resources is not uniform in space or time.

5.2.2 *Resource governance and management*

The study found that individuals' perceptions of who controls access to the natural resources, differed by regulators. Most respondents dominantly perceived that access to the natural resources is primarily controlled by the chief rather than other institutions responsible for resource governance and management such as community development forums (CDF), government (e.g. nature conservation authorities), the community itself or nobody. Historically, access to natural resources on most communal land in South Africa was controlled by traditional authorities, consisting of chiefs and their headmen or induna (Thornton, 2002; King, 2005; Twine, 2005). As noted, during the colonial and apartheid eras, these traditional authorities became bureaucratised by the prevailing governments, and continued to serve as the institution responsible for controlling the utilisation of natural resources on communal lands (Thornton, 2002; King, 2005; Twine, 2005). This could confirm why the majority of respondents in this present study perceived access to

natural resources as being mainly controlled by the chief and also why very few respondents perceived that the community controls access to resources. These findings concur with earlier studies in South Africa, which also indicated that access to natural resources on communal land is mainly controlled by the traditional authority (Twine *et al*., 2003a; Cousins, 2007). As stated, few perceived the community controls access to the natural resources on communal lands, this confirms why previous studies showed that community-based natural resource management (CBNRM) in rural communities of Southern Africa have proven less successful than anticipated despite being theoretically attractive (Campbell *et al*., 2001, Cocks *et al*., 2001, Nemarundwe, 2004).

Regarding the necessity of getting harvesting permits, this study revealed that most respondents dominantly perceived that it was necessary to get permits to harvest traditional medicine compared to other natural resources such as bushmeat, traditional medicine, wet fuelwood, fence poles, building poles, wood for carvings and furniture. This may suggest that most individuals ignore harvesting laws of the other resources excluding traditional medicine, which may suggest that there are strict customary conservation practices which might be attached to harvesting of traditional medicine such as collecting times and quantities. This can also be attributed to beliefs/taboos which individuals may have regarding harvesting of traditional medicine, for example individuals may have a belief that harvesting of traditional medicine is the domain of trained traditional medical practitioners, renowned for their skills as herbalists and diviners (Cunningham, 1991; Williams *et al*., 2000). Chacon (2012) and Krech (2005) pointed out that the existence of traditional beliefs and taboos does not guarantee sustainable harvest of natural resources while Venkataraman (2000) and Cox, (2000), reported that the beliefs and taboos have legal backing in the rules and institutions of the communities which are strong enough to make people obey the religious and cultural regulations.

Despite this the chief was perceived to be major issuer of permits to harvest natural resources rather than the nature conservation authorities. These perceptions of residents clearly indicate that respect for traditional authorities has eroded. This finding concurs with earlier studies in rural South Africa, which indicated that in theory, the traditional resource governance and management systems are still in place and that the traditional authorities have become increasingly weakened and marginalised in their role in resource governance and management in the bushveld

(Giannecchini, 2001; Twine *et al*., 2003a; Kirkland *et al*., 2007). However, a study by Simon *et al*. (2004) in Ghana reported that, in most cases villages are under the authority of traditional chiefs, who are responsible for land allocation and general leadership. Furthermore, the study showed that urbanization has undermined the role of traditional authorities. The defiance of authority and openly ignoring of harvesting laws (e.g. getting of permits to harvest natural resources) by community members to tribal leaders are highly context-specific, differ from place to places, residents in some places remain to hold their traditional chiefs in high honour (Von Maltitz & Shackleton, 2004).

5.3 Individual, household and village determinants of environmental perception

5.3.1 *Resources availability*

The individual-level characteristics (age and gender) on their own or in concert with other factors had low influence on the perceptions of resource availability, except in a few cases. This result was surprising as it differed from previous studies which show age and gender to be best predictors of environmental perceptions (Bell *et al*., 2001; Lindemann-Matties, 2002). Further, Dovie *et al*. (2008) found that age and gender are very significant factors that inform resource selection and use in many local communities. The low influence of age and gender in determining perceptions of resource availability was thus interesting. It may suggest that the influence of age and gender tends to vary for different communities concerned. If Likert Scale data (agree, strongly agree, disagree and strongly disagree) was used in analysis, more subtle differences might have been found. Therefore, future analyses should use Likert Scale data for a more nuanced analysis of perceptions. Other individual factors such as level of education might have a strong influence in determining perceptions, but unfortunately this was not assessed in this study. In this study, it was hypothesized that gender has more influence in determining individuals' perceptions than age, but the findings are not in accordance with the stated hypothesis.

The exceptional few cases where age and gender showed influence, were on the availability of grass and twigs for brooms and wood for carvings. For example, females were more likely to perceive shortages of grass and twigs than males. This is because making and using brooms is an exclusively female activity. The opposite is true for marking woodcarvings. As for age, youth and middle aged were more likely to perceive sufficient availability of grass and twigs than elderly.

This may suggest that youth and middle aged people have least understanding of availability of grass and twigs than elderly do, as most of these age groups are more likely to be engaged in formal employment and thus have less experience with grass and twigs compared to elderly who could not be engaged to formal employment because of age. Thus, the elderly, interact with the resource often making grass and twigs brooms for sale as a source of income. Supporting these findings, studies by Cocks and Dold (2004) and Shackleton (2005) found that grass and twig brooms producers and traders mainly were elderly women. For wood for carvings, age had influence on individual perceptions of availability of wood for carvings, as the youth were much less likely to perceive sufficient availability of wood for carvings than elderly. This could be attributed to the fact that the cutting of wood for carvings is more labour intensive which most of elderly people cannot willingly do. Hence, the labour intensive nature of this kind would mean that it is limited to younger age groups which is why they tend to perceive scarcity of wood for carvings. Similar observations were made regarding labour intensive timber harvesting in Tanzania, that timber harvesting activities are common among young men (Kideghesho & Msuya, 2010).

As to household level determinants, household size had a greater effect on perceptions of availability of non-consumable resources while SES had a greater effect on perceptions of availability of consumable resources. As for the exceptional cases, household size had a greater significant negative effect on perceptions of sufficient availability of bushmeat. The opposite was observed on building poles as household SES had a greater negative significant effect on perceptions of sufficient availability of building poles. In this study, it was hypothesized that household socio-economic status (SES) has more influence than household size in determining individual environmental perceptions, but the findings are not in accordance with the stated hypothesis. This could possibly be due to the small number of wealthy households in the sample. This can be explained by the fact that there are different methodologies used to group households into SES classes and the other issue could also be the cut-offs used in this study when defining household SES categories. In this study, household SES classes was calculated based on monetary indicators (e.g. number of employments and number of social grants per household). A study by Takasaki *et al*. (2001) showed that it is very difficult to fully assess household wealth after realizing that households classified as land poor were indeed rich in non-land based capital. Therefore, in order to assess the relative influence of household SES on environmental perceptions, it is essential that future studies should carefully consider many indicators when grouping

households into SES classes and the other issue could also be the cut-offs used in this study when defining categories. For instance, the involvement of local people (e.g. through participatory rural appraisal or rapid rural appraisal) in determination of the household wealth variable is recommended because local community members are considered to be equipped with the knowledge of all wealth measures or indicators considered important determinants of wealth (Adams *et al.*, 1997; Takasaki *et al.*, 2000). These indicators may not be given their precise weight by outsiders at times.

Village resided in shaped individual perceptions greatly, such that there were substantial variations in perceptions of availability, differing by resource. For example, residents of Mapaleng village strongly perceived sufficient supply for almost all resources compared to those of other villages. However, village when compared to household-level factors had a significantly stronger influence on individual's perceptions of resource availability on most resources. For example, village had an effect on the perceptions of availability of edible wild herbs while household-level factors did not. The stronger influence of village and variations on most resources could possibly be due to geographical factors (e.g. remoteness) of villages. Unfortunately, in this study village was used to determine influence, not causal relationships. Therefore, there is need for future studies to assess the influence of village geographical factors (village population size relative to communal land, remoteness, vegetation type and cover etc.) in determining individual perceptions of natural resource availability.

5.3.2 *Resource governance and management*

This present study investigated the perceptions of respondents on resource governance and management with regards to who controls access to the natural resources and how they are influenced by individual and household level characteristics, and village resided in. Except in a few cases, the individual-level factors on their own or in concert with other factors had little influence on the perceptions of who controls access to the natural resources. The little influence of individual factors on perceptions of who controls access to the natural resources, possibly could be due to individual levels of education which was not considered in this study. For example, less educated and more educated individuals are likely have different perceptions of who controls access to the natural resources. The youth and middle aged compared to elderly were less likely to perceive the chief as a person who controls access to the natural resources. On the contrary, youth

were much more likely to perceive that the government, rather than the chief, controls access to the natural resources than elderly. This could be because the youth may see the issues of natural resource governance and management as problems that the national government will solve, while disputing the control that traditional authorities have over communal resources. As indicated by Twine *et al.*, (2003a), it is widely believed that the coming of democracy in South Africa showed the end of the rule of traditional authorities, particularly among the youth because the traditional authorities no longer implemented the same level of control over resource harvesting as they had in the past.

As to household-level determinants, they had no significant influence in determining individual perceptions of who controls access to the natural resources. The reasons for this could be possibly the same as previously discussed in this same section. Except in a few cases, village had a positive significant influence on perceptions that the chief is the person who controls access to the natural resources and it had a negative significant influence on perceptions that the government controls access to the natural resources. There were variations in the influence of village among the villages on who controls access to the natural resources. The variations in perceptions of respondents could possibly indicate that differences in resource governance and management dynamics at each village may exist. Von Maltitz and Shackleton (2004), showed that different tenure arrangements exist between villages and they may differ from place to place. Unfortunately, individuals' perceptions on the functions of institutions of resource governance and management in each village was not assessed in this study as data were not collected. Therefore, future research should consider investigating individuals' perceptions on the functions of institutions of natural resource governance and management in different villages. An example of exceptional cases where village did not have a significant influence was that nobody controls access to the resources. This may possibly show that respondents know that institutions of resource governance and management exists in villages, despite being weakened and marginalised (Giannecchini, 2001; Twine *et al*., 2003a; Kirkland *et al*., 2007) and that is why respondents were less likely to perceive nobody controls the access to the natural resources.

Regarding resource governance and management, this study also investigated the influence of individual and household level characteristics, and village resided in, on individuals' perceptions of the necessity of getting harvesting permits and that the permits were issued by either the chief

or nature conservation authorities. The individual-level characteristics on their own or in concert with other factors had influence on the perceptions of governance and management, except in a few cases. This influence of age and gender was expected because perceptions of governance and management are more personal compared to perceptions of resource availability. Age, when compared to gender, had a negative significantly stronger influence on most of resources with regards to the necessity of get harvesting permits and that the chief was the person who issue harvesting permits. The stronger influence of age compared to gender could possibly be due to situations people experience and changes which take place on their environment they live in as they grow. For instance, the youth and middle aged compared to elderly were less likely to perceive it was necessary to get harvesting permits to harvest fence poles and wood for carving and that the chief is the person who issue permits to harvest resources. Supporting this finding, Twine *et al.* (2003a) found that it is widely believed that with the coming of democracy in South Africa most people particularly among the youth, no longer see traditional authorities as having the same level of control over natural resources in implementing the rules effectively.

Household-level characteristics had no significant influence on perceptions of resource governance and management regarding necessity of getting harvesting permits and that harvesting permits were issued by either the chief or nature conservation authorities. This is because perceptions of governance and management are more personal than perceptions of availability, which are shaped by household factors that are related to natural resource use. This could also be attributed to the small number of wealthy households in the sample and the other issue could also be the cut-offs which were used in this study when defining household SES categories. Similarly, as discussed in previous section future studies should consider many indicators when ascertaining household SES classes. Village resided in had a stronger influence on the perceptions of resource governance and management with substantial variations compared to household-level characteristics which had no significant influence. The insignificant influence of household-level characteristics could be the same reasons as previously mentioned. The influence of village had variations in individuals' perceptions on the necessity of getting harvesting permits despite the chief being perceived to be the ultimate authority in issuing harvesting permits than the nature conservation authorities. This shows that traditional authorities are still in place in most villages despite the decline in authority of traditional authority to effectively implement rules regarding natural resource management (Giannecchini, 2001; Twine *et al.*, 2003a; Kirkland *et al.*, 2007).

It is very important to note that the relationship between environmental perceptions and behaviour to influence governance and management pattern cannot be linear (as in many local communities and indigenous people may have different beliefs about resource governance and management) and it is consequently far more complex than it is sometimes expected. Furthermore, environmental behavior is not only dependent on motivational factors but is also determined by contextual factors, such as individual opportunities and abilities (Poortinga, 2004).

5.4 The influence of household resource use on environmental perception

5.4.1 *Resource availability*

This study revealed that there was a significant relationship between household resource use patterns and perceptions of local resource availability for consumable resources, except in the case of fuelwood and traditional medicine. Despite these few exceptional cases, the finding support the stated hypothesis that individuals from households which depend highly on natural resources are more likely to perceive shortages of the local natural resources. The households which depended heavily on consumable natural resources, by making regular use of the resource were less likely to perceive sufficient local availability of a particular consumable resource. This is because the households which use a resource often are likely to be harvesting a particular resource from the bush frequently and notice a change in supply of that resource. As for fuelwood and traditional medicine, it shows that household frequency of use of fuelwood and traditional medicine are not associated with the perceptions of local availability. For instance, fuelwood use patterns do not change with decline in availability but methods of acquisition do change (Matsika *et al*., 2012). The reason for this lack of association may be attributed to limited ability of rural household to make the completely transition to electricity from fuelwood, as the cost of electricity is the major deterrent (Williams & Shackleton, 2002). As for traditional medicine, lack of association may suggests that there is limited use of traditional medicine by most households leading to a perception of local shortage. It can also be attributed to a number of residents who may belong to religious groups that forbid the use of traditional medicine because of its perceived association with witchcraft (Kalaba *et al*., 2013). The imposition of religious sanctions on users of traditional medicines has also been reported in rural communities in the South African savanna (Shackleton *et al.,* 2007).

Interestingly, this study revealed that households which never consumed bushmeat were much less likely to perceive adequate supply of bushmeat than those which consumed it. This may suggest that the patterns of bushmeat consumptions are poorly defined in the area. A study by Foerster *et al*., (2012) in Gabon showed that comprehensive empirical assessments of the correlates of bushmeat consumption are still relatively scarce and often have had contrasting results. Household resource use also significantly influenced individuals perceptions of resource availability for non-consumable resources with the exception of reeds. The households which did not use or own a particular non-consumable natural product were found to be much more likely to perceive sufficient supply of a resources compared to those which used or owned a non-consumable natural products in their households. This confirms that households which depend heavily on non-consumable resources are more likely to perceive shortages of a particular resources.

5.4.2 *Resource governance and management*

The extent to which local natural resources are used may vary substantially among households and the value that a household places on natural resources can have a significant implication on how those resources are governed and managed in relation to perceptions of who controls access to the natural resources. This study found that as household resource use increases, the chances of individuals perceiving that the community development forum (CDF) and the community control access to the natural resources increases. This finding suggests that as household resource use increases the individuals tend to believe that the CDF and the community itself controls access to the natural resources. It is clear the demand of household resource use shapes individuals' perceptions of who governs and manages resources in relation to who controls access to the natural resources.

6.0 CONCLUSION

This study aimed to identify dominant environmental perceptions and their determinants at individual, household and village levels, with a focus on environmental resource availability, resource use, and resource governance and management, among rural inhabitants in Bushbuckridge region in Mpumalanga Province, South Africa. Firstly, the study investigated local resource use patterns and dominant local perceptions regarding resource availability and resource governance and management among rural inhabitants. It was clear that resource use pattern and perception of resource availability, resource governance and management by members of a community change over time and can be extremely dynamic between communities. Secondly, the study assessed the relative influence of village, household and individual characteristics in determining environmental perceptions of an individual. There was low influence of individual-level determinants (age and gender) in determining perceptions of resource availability which suggest that the influence of age and gender tends to vary for different communities and issues concerned. As for resource governance and management, there was a strong influence of age and gender in determining perceptions. This shows that perceptions of resource governance and management are more personal than perceptions of resource availability. As to household-level determinants, they did not show a convincing influence in shaping perceptions of an individual as expected. Village resided in shaped perceptions greatly, such that there were substantial variations in perceptions of resource availability, resource governance and management differing by village. Thirdly, the study explored the relationship between household resource use and individual perceptions of resource availability, and resource governance and management in rural communities. The households which depends heavily on natural resources, by making regular use of the resource are less likely to perceive sufficient local availability of a particular resource. The demand of household resource use shapes individuals' perceptions of who governs and manages resources in relation to who controls access to the natural resources.

Human dependence on natural resources is high in Bushbuckridge as most of the resources were used by most households and the drivers of resource use are diverse, variable and interactive. When dealing with environmental perceptions regarding resource availability, and resource governance and management a deeper understanding of the socio-economic processes that shape human-environment interactions is very important. As environmental perceptions vary within and between

communities, and are shaped by the characteristics and circumstances of the individual, their households and the community they live in. Furthermore, the strength of influence of these determinants vary according to the particular resource and environmental governance issue concerned. In this study, individual and household level factors had minimal influence on environmental perceptions in most instances compared to village resided in. It is crucial to examine the factors that may influence environmental perceptions and variations among the communities. Therefore, the findings of this study will form a basis in understanding determinants of environmental perceptions which will lead to a more in-depth and fully scaled future research. They may also offer more insight to policy makers who attempt to conserve natural resources and promote sustainable rural development. The policy makers should make sure they identify factors that shape individuals' environmental perceptions in order to achieve effective policy implementation and sustainable management strategies. Furthermore, understanding the determinants of environmental perceptions will be helpful for policy makers as it could establish solutions that are grounded in rural communities' realities and their environmental perceptions.

This study's scope was limited to respondents' environmental perceptions disaggregated by individual and household level characteristics, and village resided in. Thus, it did not cancel out the possibilities that other factors may shape one's environmental perceptions. Therefore, it is recommended that the best methodology of assessing household socio-economic status (SES) class should incorporates a number of criteria relevant to the research area. It is important for factors such as individual's level of education, occupation and village geographic factors (such as village population size relative to communal land, remoteness, vegetation type and cover etc.) be included in a follow-up research about environmental perceptions since it will strengthen the validity and understand more fully the complexities of factors that might shape individual's environmental perceptions. It is also important for future studies in their analyses to use Likert Scale data for a more nuanced analysis of environmental perceptions.

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8.0 APPENDIX

8.1 Appendix 1: Questionnaire for households survey

CARNEGIE SOCIAL JUSTICE PROGRAMME

'Environmental Social Justice in Rural South Africa'

University of the Witwatersrand

2006

Comments …….

…….

Questionnaire number ……

Questionnaire completed: 1. Yes

2. No

Gender stratum: 1. Male

2. Female

Age stratum: 1. 18 - 34

2. 35 - 49

3. 50 +

Village: …….

Fieldworker: ……

Date of Visit: ……

A. DETAILS OF RESPONDENT AND HOUSEHOLD

1. Gender: Male ☐ Female ☐
2. Age: ……or born in year 19……..
3. Position in household:…….
4. Number of permanent household members: (*eat and stay with the family at least 4x per week*)
5. Number of people with:

Permanent job	Temporary job	Social grant

6. Number of migrants household members: …….
7. Where were your parents born? Father:…… and Mother:……
8. When did your family move to this village? :……

9. How many of the following does your household own?

Cattle	Goats	Sheep	Pigs	Donkeys	Chickens

10. What sort of fuel does your household use for cooking?

(Circle the appropriate number-more than one possible)

1. Wood 2. Paraffin 3. Electricity 4. Gas 5. Other

11. If more than one fuel is used, which one is used most often?

(Tick the appropriate answer-more than one possible)

1. Wood 2. Paraffin 3. Electricity 4. Gas 5. Other

12. Does this household have access to electricity? Yes/ No *(Tick appropriate answer)*

13. Does this household use Fuelwood for cooking? Yes/ No *(Tick appropriate answer)*

*If answered "yes" to both 12 and 13, then go to **14**, otherwise go to **15***

14. Why do you use wood for cooking instead of using electricity?

(Circle the appropriate number-more than one possible)

1. Wood is free or cheaper
2. We can't afford a stove
3. Electricity is weaker
4. Food taste better when cooked on a fire
5. Other:……..

15. Where does your household get its water from?

(Circle the appropriate number-more than one possible)

1. Tap in the household's yard
2. Tap in somebody else's yard
3. Stand-pipe tap in the village
4. Tap in another village
5. Well
6. Dam
7. River
8. Spring
9. Buy from people with vehicles
10 Other:……

B. RESOURCE USE

16. I would like to ask you about the natural resources from the bush used by this household. *(Tick the relevant answer)*

1) Does this household use the following resources? *(tick if used)*
2) If so, how often has your household used or obtained the following natural products in the last 12 months, when in season? *(tick)*

Resource	Use	Everyday	4-6 times/week	1-3times/week	Less often	Never
Wild edible herbs						
Wild fruits						
Edible insects						
Bushmeat						
Fuelwood						
Tradition medicine						
Building poles						
Wood for carvings						
Fence poles						
Thatching grass						
Grass & twigs brooms						
Reeds for mats						
Sand for bricks						

17. If your household collects the following resources, where are they collected from? *(Tick the relevant answer-more than one possible)*

Resources	Around this village	Around other villages in Bushbuckridge	Other villages or towns in other municipalities	Private farms	Game reserves or forestry land	Next to tar roads
Edible wild herbs						
Wild fruits						
Edible insects						
Bushmeat						
Fuelwood						
Traditional medicine						
Fence poles						
Building poles						
Wood for carvings						
Thatching grass						
Grass and twigs brooms						
Reeds for mats						
Sand for bricks						

18. Who in the household collects these resources? *(Write the number of people under the relevant column).*

Resource	Child (1-4)		Young adult (15-34)		Middle-age adult (35-49)		Elderly adult (50+)	
	Male	Female	Male	Female	Male	Female	Male	Female
Wild edible herbs								
Wild fruits								
Edible insects								
Bushmeat								
Fuelwood								
Traditional medicine								
Fence poles								
Building poles								
Wood carvings								
Thatching grass								
Grass & twigs for brooms								
Reeds for mats								
Sand for bricks								

19. Collection of resources;

a) Roughly how often do they collect the following resources, when in season, and

b) How many hours does it take them to collect them per trip?

Resource	*Times per* (*choose one*)			Hours per trip
	Year	Month	Week	
Edible wild herbs (e.g. guxe)				
Wild fruit (e.g. marula)				
Edible insects (e.g. locusts)				
Bushmeat (e.g. rabbits)				
Fuelwood				
Traditional medicine				
Grass & twigs for brooms				
Fence poles				
Building poles				
Wood for carvings				
Thatching grass				
Reeds for mats				
Sand for bricks				

20. If your household buys the following resources, where are they bought from?

(Tick the relevant answer-more than one possible)

Resources	This village	Around other villages in Bushbuckridge	Other villages or towns in other municipalities	Private farms	Game reserves or forestry land
Edible wild herbs					
Wild fruits					
Edible insects					
Bushmeat					
Fuelwood					
Traditional medicine					
Fence poles					
Building poles					
Wood for carvings					
Thatching grass					
Grass and twigs					
Reeds for mats					
Sand for bricks					

21. Who in the household buys these resources? *(write the number of people under the relevant column)*

Resource	Child (1-4)		Young adult (15-34)		Middle-age adult (35-49)		Elderly adult (50+)	
	Male	Female	Male	Female	Male	Female	Male	Female
Edible wild herb (e.g. guxe)								
Wild fruits (e.g. marula)								
Edible insects (e.g. locusts)								
Bushmeat (e.g. rabbits)								
Fuelwood								
Traditional medicine								
Grass and twigs for brooms								
Fence poles								
Building poles								
Wood carvings								
Thatching grass								
Reeds for mats								
Sand for bricks								

22. How much has this household spent per month (when in season) or per year on the resources you buy in the last 12 months?

Resource	*Rands per* (*choose one*)	
	Month	Year
Edible wild herbs (e.g. guxe)		
Wild fruits (e.g. marula)		
Edible insects (e.g. locusts)		
Bushmeat (e.g. rabbits)		
Fuelwood		
Traditional medicine		
Grass and twigs for brooms		
Fence poles		
Building poles		
Wood for carvings		
Thatching grass		
Reeds for mats		
Sand for bricks		
Water (including from taps)		

C. TRADE IN NATURAL RESOURCES

23. I would now like to ask you some questions about how your household uses natural resources to get income.

1) In the last 12 months, has anybody in this household sold the following natural resources to make money? *(Tick if "yes", and go to 2,3,4 & 5, otherwise go to next item on the list)*
2) If so, for how many months in the last 12 months? *(fill in)*
3) What was the average income per month from this resource? *(fill in)*
4) In what year did your household first start selling this resource? *(fill in)*
5) What was the money used for? *(fill in)*

Resource	Sold	Months out of 12 months	Rand/ month	Year started	The money was used for:
Edible wild herbs					
Wild fruits					
Marula beer					
Marula jam					
Marula nuts					
Edible insects					
Bushmeat					
Wild animal skin					
Fish from local dam/river					
Honey from bush					
Thatching grass					
Fuelwood					
Fence poles					
Building poles					
Wooden carvings/utensils					
Furniture made from wood					
Reed mats					
Traditional baskets					
Hand brooms					
Traditional medicine					
Traditional clay pots					
Local sand (Bricks)					
Other:……					

24. Who in the household sold the resources? *(write the number of people under the relevant column)*

Resource	Child (1-4)		Young adult (15-34)		Middle-age adult (35-49)		Elderly adult (50+)	
	Male	Female	Male	Female	Male	Female	Male	Female
Edible wild herbs								
Wild fruits								
Marula beer								
Marula jam								
Marula nuts								
Edible insects								
Bushmeat								
Wild animal skin								
Fish from local dam/river								
Honey from bush								
Thatching grass								
Fuelwood								
Fence poles								
Building poles								
Wooden carvings/utensils								
Furniture made from wood								
Reed mats								
Traditional baskets								
Hand brooms								
Traditional medicine								
Traditional clay pots								
Local sand (Bricks)								
Other:…….								

25. Why did the household start selling these resources? *(circle the appropriate number-more than one possible)*

1. The household income is not enough
2. Nobody in the household is employed
3. A household member was retrenched
4. The breadwinner has retrenched
5. A pensioner has passed away
6. The person selling the resource needed to buy something for the household
7. The person selling the resource needed to buy something for the household
8. Other:…….

D. RESOURCE AVAILABILITY

I would like to now ask you about the availability of natural resources in the area.

26. Over the last 10 years (since 1996), is the availability of these resources sufficient, or insufficient ? (*Tick one per resource*)

Resource	Sufficient	Insufficient	Don't know
Edible wild herb (e.g. guxe)			
Wild fruits (e.g. marula)			
Edible insects (e.g. locusts)			
Bushmeat (e.g. birds rabbits)			
Fuelwood			
Grass and twigs for brooms			
Fence poles			
Building poles			
Wood for carvings			
Traditional medicine			
Thatching grass			
Reeds for mats			
Grazing land for cattle and goats			
Cultivation land for crops			

27. Over the last 10 years (since 1996), has the amount of time it takes to go and collect these resources increased, decreased or stayed the same? (*Tick one per resource*)

Resource	Increased	Decreased	Stayed the same	Don't know
Edible wild herbs (e.g. guxe)				
Wild fruits (e.g. marula)				
Edible insects (e.g. locusts)				
Bushmeat (e.g. rabbits)				
Fuelwood				
Traditional medicine				
Grass and twigs for brooms				
Fence poles				
Building poles				
Wood for carvings				
Thatching grass				
Reeds for mats				

28. Which of these resources:

1) Are in short supply these days, even when in season and (*tick*)
2) Were in short supply ten years ago (in 1996) (*tick*)

Please tell me how shortages of these have affected your household.

Resource	In short supply now	In short supply 10 years ago	The effect of shortages on your household have been:
Edible wild herbs			
Wild fruits			
Edible insects			
Bushmeat			
Fuelwood			
Traditional medicine			
Grass and twigs for brooms			
Fence poles			
Building poles			
Wood for carvings			
Thatching grass			
Reeds for mats			
Grazing land for livestock			
Cultivation land for crops			

29. If, in the future, you cannot get enough (resource name) from around here because people have used it all up, what will you do? (*tick*)

Resource	Not applicable	Do without	Buy	Use alternative	Obtain it somewhere else	Other
Edible wild herbs						
Wild fruits						
Edible insects						
Bushmeat						
Traditional medicine						
Grass and twigs for brooms						
Fuelwood						
Fence poles						
Building poles						
Wood for carvings						
Thatching grass						
Reeds for mats						
Grazing land for livestock						
Cultivation land for crops						

E. ACCESS AND CONTROL OF NATURAL RESOURCES

Please tell me how strongly you disagree or agree with the following statement for each the resources below:

30. You are free to collect as much (resource name) as you want from the bush. (*tick one per resource*)

Resource	Strongly disagree	Disagree	Agree	Strongly agree
Edible wild herbs				
Wild fruits				
Edible insects				
Bushmeat				
Traditional medicine				
Fuelwood				
Grass and twigs for brooms				
Fence poles				
Building poles				
Wood for carvings				
Thatching grass				
Reeds for mats				

31. In the early 1990's (1990-1993), you were free to collect as much (resource name) as you wanted from bush. (*Tick one per resource*)

Resource	Strongly disagree	Disagree	Agree	Strongly agree
Edible wild herbs				
Wild fruits				
Edible insects				
Bushmeat				
Traditional medicine				
Fuelwood				
Grass and twigs for brooms				
Fence poles				
Building poles				
Wood for carvings				
Thatching grass				
Reeds for mats				

32. It is necessary to get permits to harvest (resource name) from the bush. (*tick one per resource*)

Resource	Strongly disagree	Disagree	Agree	Strongly agree
Bushmeat				
Traditional medicine				
Wet Fuelwood				
Fence poles				
Building poles				
Wood for carvings				
Wood for furniture				

33. If it is necessary to get permits, who issues them? (*Circle the appropriate number – more than one possible*)

1. Chief/induna
2. Nature Conservation authorities
3. Other:…….
4 Not applicable

34. In the early 1990's (1990-1993), it was necessary to get permits to harvest (resource name) from the bush. (*tick one per resource*)

Resource	Strongly disagree	Disagree	Agree	Strongly agree
Bushmeat				
Traditional medicine				
Wet fuelwood				
Fence poles				
Building poles				
Wood for carvings				
Sand for making bricks				
Wood for furniture				

35. If it was necessary to get permits, who issued them? (*circle the appropriate number – more than one possible*)

1. Chief/induna
2. Nature Conservation authorities
3. Other:…….
4 Not applicable

36. Please tell me how strongly you disagree or agree with the following statements: (*tick one per statement*)

#	statement	Strongly disagree	disagree	Agree	Strongly agree
1a	Now, there are customs and traditions governing the use and access to natural resources in this area.				
1b	In the early 1990s, there were customs and traditions governing the use and access to natural resources in this area.				
2a	Now, there are rules and laws governing the use and access to natural resources in this area.				
2b	In the early 1990s, there were rules and laws governing the use and access to natural resources in this area.				
3a	Now, people harvest whatever they wanted				
3b	In early 1990s, people harvest whatever they wanted				
4a	Now, the chief and the induna control access to the natural resources around your village.				
4b	In the early 1990s, the chief and the induna controlled access to the natural resources around your village.				
5a	Now, the chief fines people if they harvest live wood.				
5b	In early 1990s, the chief fined people if they harvested live wood.				

#	statement	Strongly disagree	disagree	Agree	Strongly agree
6a	The community development forum (CDF) is involved in matters relating to natural resources.				
6b	In the early 1990s, the civic organization was involved in matters relating to natural resources.				
7a	Now, the government nature conservation officials fined people if they harvested live wood				
7b	In early 1990s,the government nature conservation officials fined people if they harvested live wood				
8a	Now, people from other villages come to harvest resources around your village				
8b	In the early 1990s,people from other villages came to harvest resources around your village				
9a	People mostly from this village are cutting live trees around this village				
9b	People mostly from other villages are cutting live trees around this village				

37. Please tell me how strongly you disagree or agree with the following statements: (*tick one per statement*)

#	statement	Strongly disagree	disagree	Agree	Strongly agree
1	People started doing as they wished after freedom and democracy.				
2	People stopped listening to the traditional authority after freedom and democracy.				
3	People have the right to do what they want because we have freedom and democracy.				
4	Because we have freedom and democracy, nobody can tell you to stop cutting a live tree.				
5	If nobody controls natural resources around your village, they will all be finished				
6	Somebody should control the use of natural resources around your village				
7	You have the right to have a say in how the natural resources around this village are managed				

38. Who currently controls access to the natural resources around this village? (*circle the appropriate number – more than one possible*)

1. Nobody
2. Chief/induna
3. Community Development Forum (CDF)
4. Government (e.g. nature conservation)
5. The community

39. Who do you think should control access to the natural resources around this village? (*circle the appropriate number – more than one possible*)

1. Nobody
2. Chief/induna
3. Community Development Forum (CDF)
4. Government (e.g. nature conservation)
5. The community

40. The constitution of our country is a document which lists all the rights that people living here have, such as the right of access to basic health care. Please tell me how strongly you disagree or agree with the following statements about South Africa's constitution.

#	statement	Strongly disagree	disagree	Agree	Strongly agree
1	The constitution of South Africa says that you have the right to have the environment protected for your benefits.				
2	The constitution of South Africa says that you have the right to live in a healthy environment.				
3	The constitution of South Africa says that you have the right to destroy nature for your benefit.				

41. Please tell me how strongly you disagree or agree with the following statements: (tick one *per statement*)

#	statement	Strongly disagree	disagree	Agree	Strongly agree
1	A woman can tell a man to stop cutting a live tree				
2	A man can tell a woman to stop cutting a live tree				
3	An old person can tell a young person to stop cutting a live tree				
4	An young person can tell an old person to stop cutting a live tree				
5	You can tell somebody from your village to stop cutting a live tree				
6	Somebody from your village can tell you to stop cutting a live tree				
7	You can tell somebody from another village to stop cutting a live tree near to your village				
8	Somebody from another village can tell you to stop cutting a live tree near to your village				

42. Please tell me about your personal experience of the following: (*tick and fill in*)

#	Question	Yes	No	Who?	What resource
1	Has anybody tried to stop you from harvesting resources or cultivating land around here since 1994?				
2	Did anybody try to stop you from harvesting any resources or cultivating land around here before 1994?				
3	Have you tried to stop somebody else from harvesting any resources or cultivating land since 1994?				
4	Did you ever try to stop somebody from harvesting a resource or cultivating land before 1994?				
5	Have you ever reported somebody else for harvesting resources or cultivating land illegally since 1994?				
6	Did you ever report somebody else for harvesting resources or cultivating land illegally before 1994?				
7	Since 1994, have you ever had to pay a fine to the chief or nature conservation officials for harvesting a resource or cultivating land illegally?				
8	Before 1994, did you ever have to pay a fine to the chief or nature conservation officials for harvesting a resource or cultivating land illegally?				
9	Since 1994, have you obtained a permit from anybody to harvest any resource?				
10	Before 1994, did you obtain a permit from anybody to harvest any resource?				
11	Are you afraid of criminals when you go into the bush?				
12	Were you afraid of criminals when you went into the bush in the early 1990?				

THANK YOU FOR YOUR TIME